

5 Power sections for converters - IndraDrive C

5.1 Types

Converter	Types	Features
HCS02	W0012	Compact modular design 1.5 kW to 11 kW Continuous currents up to 28 A
	W0028	
	W0054	
	W0070	
HCS03	W0070	Compact modular design 25 kW to 120 kW Continuous currents up to 200 A
	W0100	
	W0150	
	W0210	
	W0280	
	W0350	

Tab. 5-1: Types

5.2 HCS02 Power sections

5.2.1 Brief description, use and design

Short description The compact converters HCS02 are part of the Rexroth IndraDrive C product range and are used to operate single axes.

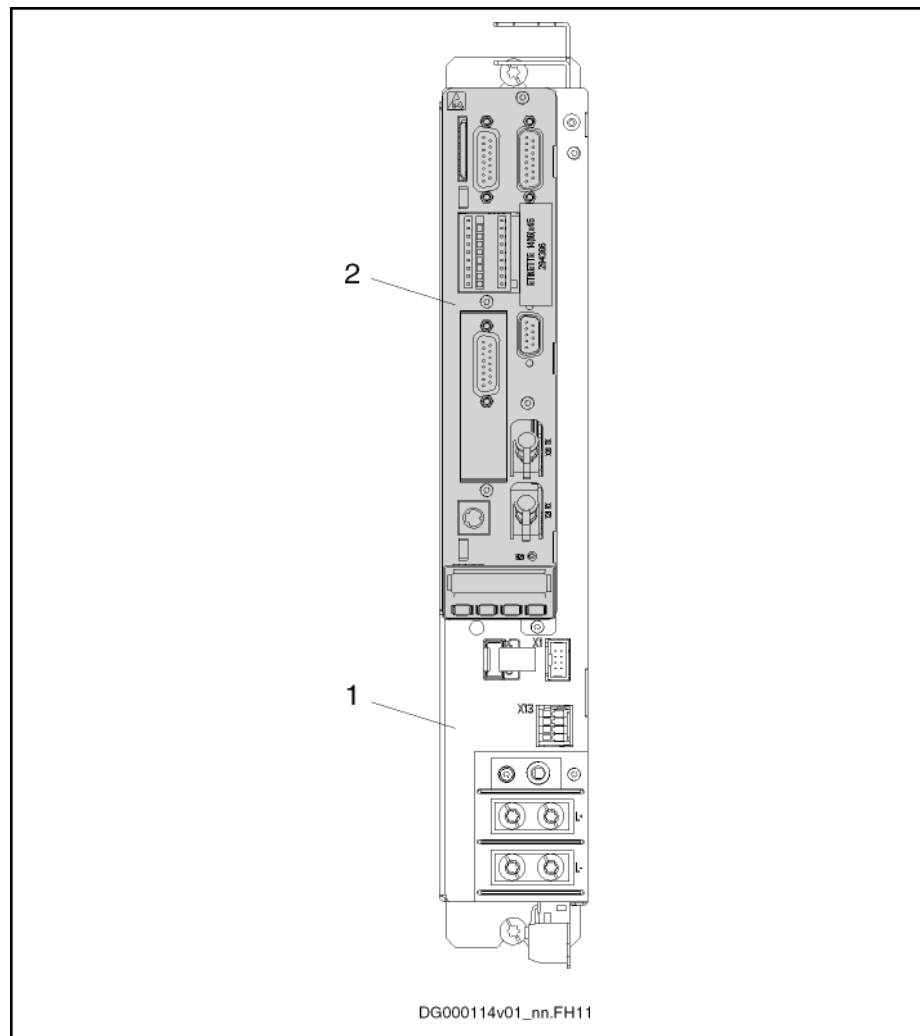
Use The different types are used as follows:

Type	Use
HCS02.1E-Wxxxx-NNNN HCS02.1E-Wxxxx-NNNV	Operation of a three-phase a.c. motor (asynchronous or synchronous motor) in the power range from 1.5 kW to 11 kW.
HCS02.1E-Wxxxx-LxxN Load-dependent fan control	Applications with operation at partial load and requirement of a low degree of noise development.

Tab. 5-2: Usage of HCS02

Power sections for converters - IndraDrive C

Structure, block diagrams

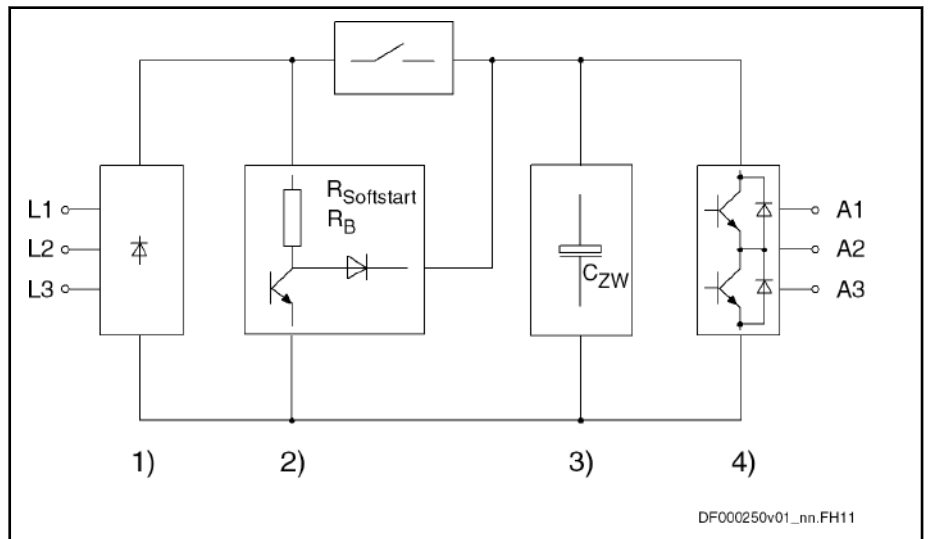


- 1 Power section
2 Control section

Fig. 5-1: Basic Structure of the Drive Controller

Power sections for converters - IndraDrive C

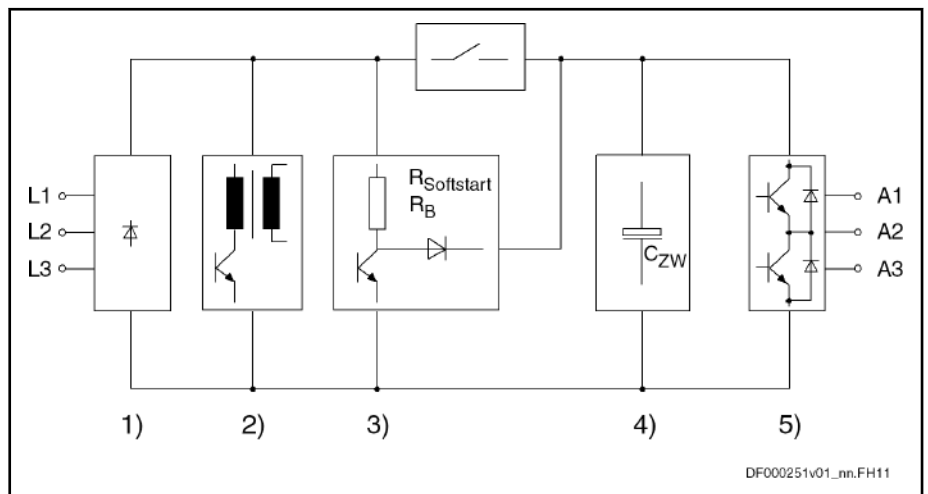
HCS02.1E-W0012-NNNN; -LNNN



- 1) Mains input with rectifier
- 2) Braking resistor circuit; charging current limitation
- 3) DC bus capacitances
- 4) Inverter stage with output to motor

Fig. 5-2: HCS02.1E-W0012-NNNN, -LNNN - Block Diagram

HCS02.1E-W0012-NNNV

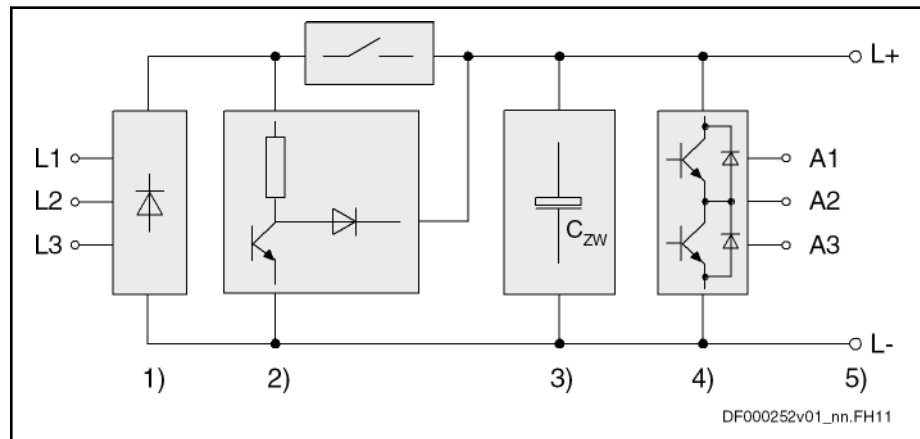


- 1) Mains input with rectifier
- 2) Optional integrated control voltage supply
- 3) Braking resistor circuit; charging current limitation
- 4) DC bus capacitances
- 5) Inverter stage with output to motor

Fig. 5-3: HCS02.1E-W0012-NNNV - Block Diagram

Power sections for converters - IndraDrive C

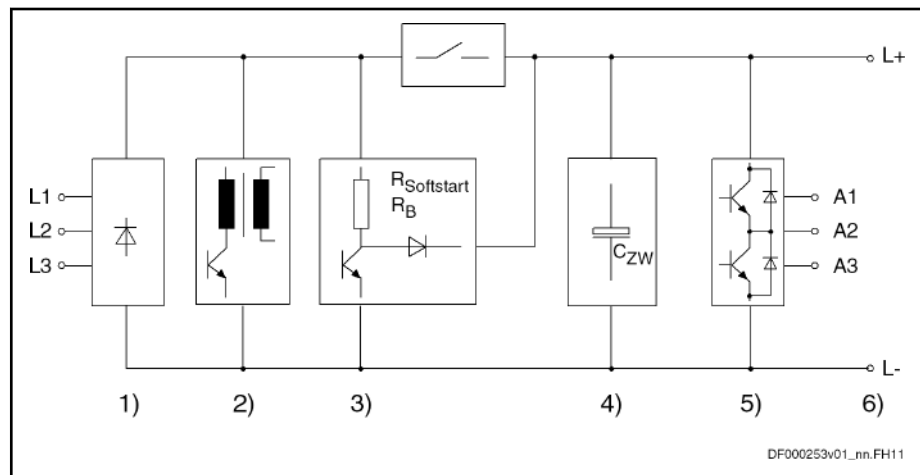
HCS02.1E-W0028-NNNN; -LNNN



- 1) Mains input with rectifier
- 2) Braking resistor circuit; charging current limitation
- 3) DC bus capacitances
- 4) Inverter stage with output to motor
- 5) DC bus connection

Fig. 5-4: HCS02.1E-W0028-NNNN; -LNNN - Block Diagram

HCS02.1E-W0028-NNNV

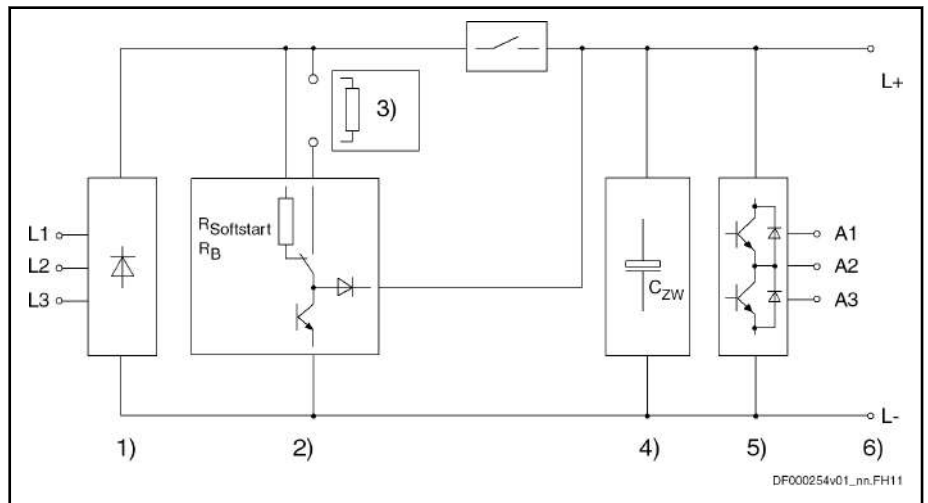


- 1) Mains input with rectifier
- 2) Optional integrated control voltage supply
- 3) Braking resistor circuit; charging current limitation
- 4) DC bus capacitances
- 5) Inverter stage with output to motor
- 6) DC bus connection

Fig. 5-5: HCS02.1E-W0028-NNNV - Block Diagram

Power sections for converters - IndraDrive C

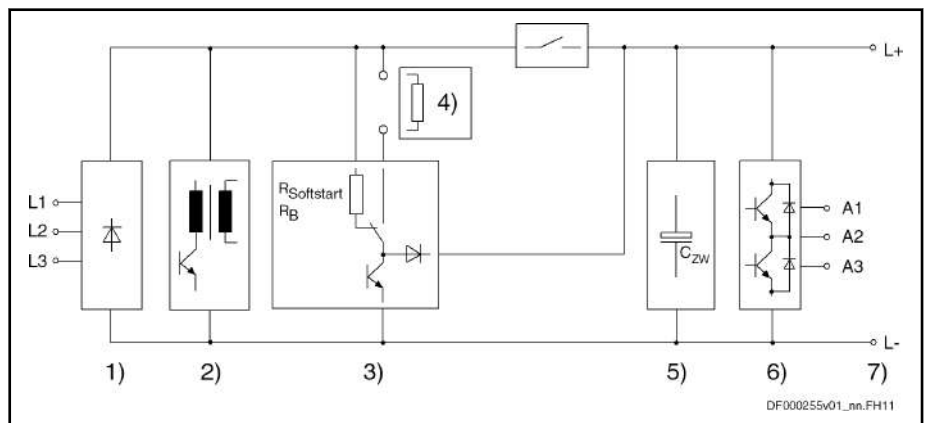
HCS02.1E-W0054/70-NNNN; -LNNN



- 1) Mains input with rectifier
- 2) Braking resistor circuit; charging current limitation
- 3) Optional external braking resistor (activated via parameter "P-0-0860, Converter configuration")
- 4) DC bus capacitances
- 5) Inverter stage with output to motor
- 6) DC bus connection

Fig. 5-6: HCS02.1E-W0054/70-NNNN; -LNNN - Block Diagram

HCS02.1E-W0054/70-NNNV



- 1) Mains input with rectifier
- 2) Optional integrated control voltage supply
- 3) Braking resistor circuit; charging current limitation
- 4) Optional external braking resistor (activated via parameter "P-0-0860, Converter configuration")
- 5) DC bus capacitances
- 6) Inverter stage with output to motor
- 7) DC bus connection

Fig. 5-7: HCS02.1E-W0054/70-NNNV - Block Diagram

5.2.2 Type code and identification

Type Code



The following figure illustrates the basic structure of the type code. Our sales representative will help you with the current status of available versions.

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Abbrev. Column	1	2	3	4	5	6	7	8	9	1	0	1	2	3	4	5	6	7	8	9	2	0	1	2	3	4	5	6	7	8	9	3	0	1	2	3	4	5	6	7	8	9	4	0						
Example:	H	C	S	0	2	.	1	E	-	W	0	0	1	2	-	A	-	0	3	-	N	N	N	N																										

1. **Product**
 1.1 HCS..... = HCS

2. **Line**
 2.1 1.5 to 11 kW. = 02

3. **Design**
 3.1 1..... = 1

4. **Power supply**
 4.1 Infeeding..... = E

5. **Cooling mode**
 5.1 Air, internal (through integrated blower) = W

6. **Maximum current**
 6.1 12 A = 0012
 6.2 28 A = 0028
 6.3 54 A = 0054
 6.4 70 A = 0070

7. **Degree of protection**
 7.1 IP 20. = A

8. **Mains connection voltage**
 8.1 AC 200 to 500V ±10% = 03

9. **Other design**
 9.1 None. = NNNN
 9.2 Temperature-dependent blower control = LNNN
 9.3 DC 24 V power supply from DC bus and from external = NNNV

10. **Standard reference**

Standard	Title	Edition
DIN EN 60529	Degrees of protection provided by enclosures (IP-Code)	2000-09

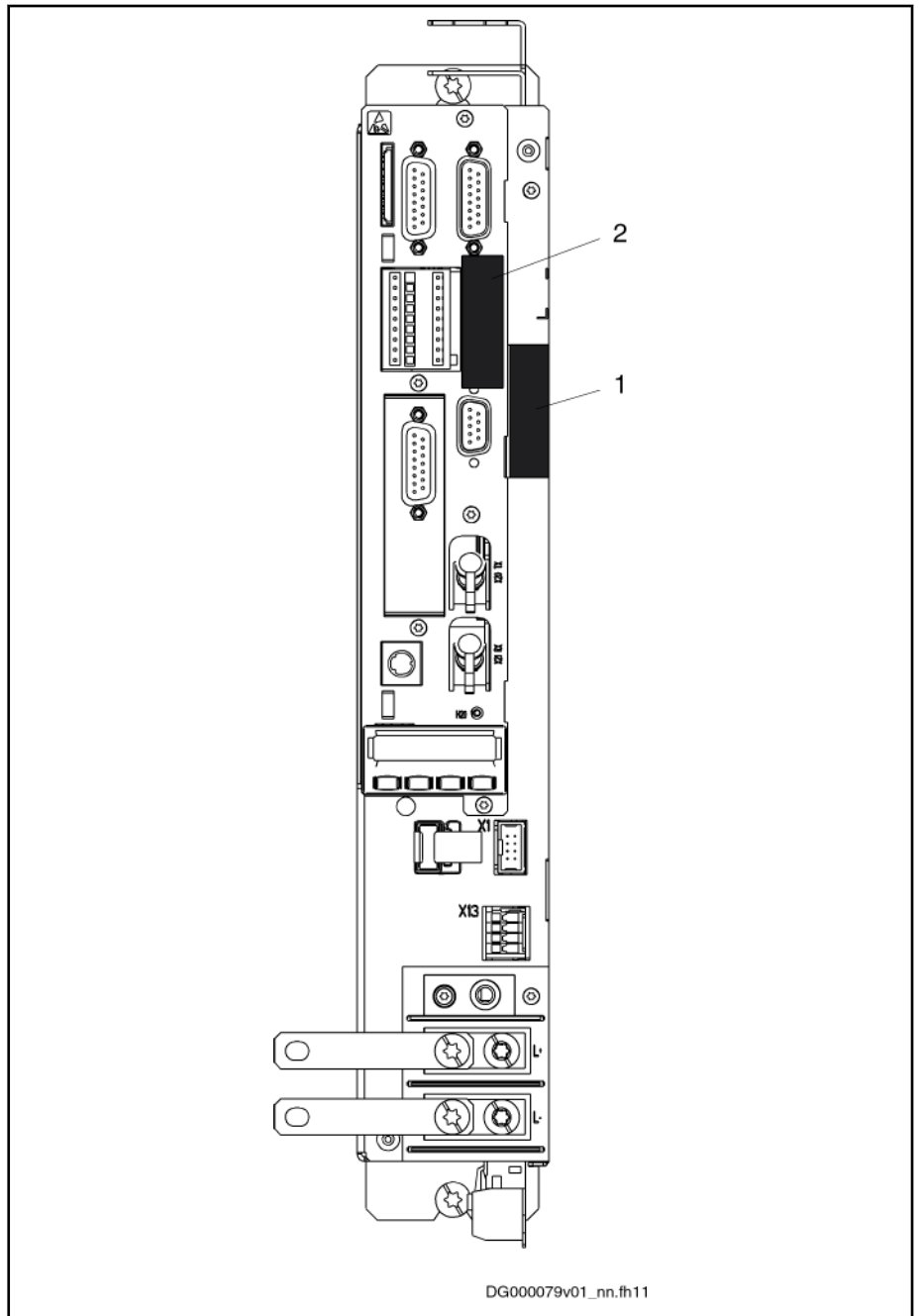
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Fig. 5-8: Type Code HCS02

Power sections for converters - IndraDrive C

Identification

Type plate arrangement

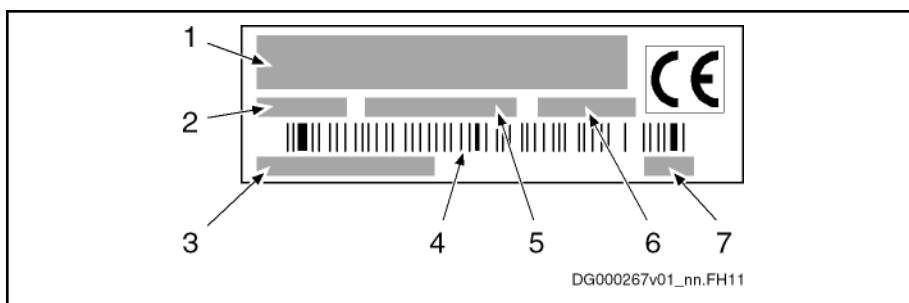


- 1 power section type plate
- 2 control section type plate

Fig. 5-9: Type plate arrangement

Power sections for converters - IndraDrive C

Type plate (power sections, supply units)



- 1 Device type
- 2 Part number
- 3 Serial number
- 4 Bar code
- 5 Country of manufacture
- 6 Production week; e.g. 08W23 meaning year 2008, week 23
- 7 Hardware index

Fig. 5-10: Type Plate (Power Sections, Supply Units)

5.2.3 Scope of supply

- 1 x touch guard
- Connectors for the electrical connection points at the device
- 1 x Instruction Manual (in the English language)

5.2.4 Technical data

Ambient and operating conditions

General information

Conditions for [transport](#) and [storage](#): See [chapter 4.2 "Transport and storage"](#) on page 29.

Installation conditions: See [chapter 4.3 "Installation conditions"](#) on page 30.

This chapter contains:

- Limit values for use in the scope of CSA / UL
- Applied standards (CE conformity, UL listing)

UL Data

Ambient and operating conditions - UL ratings

Description	Symbol	Unit	HCS02.1E-W0012-_-03	HCS02.1E-W0028-_-03	HCS02.1E-W0054-_-03	HCS02.1E-W0070-_-03
Short circuit current rating	SCCR	A rms	42000			
Rated input voltage, power ¹⁾	U_{LN_nenn}	V	3 x AC 200...500			
Rated input current	I_{LN}	A	6.0	13.0	20.0	30.0
Output voltage	U_{out}	V	3 x AC 0...530			
Output current	I_{out}	A	4.5	12.0	20.6	28.0
Last modification: 2017-01-23						

1) Mains input L1, L2, L3 (for HMV and HCS only); For use on a solidly grounded wye source only.

Tab. 5-3: HCS - Ambient and operating conditions - UL ratings

Information on standards**Applied Standards**

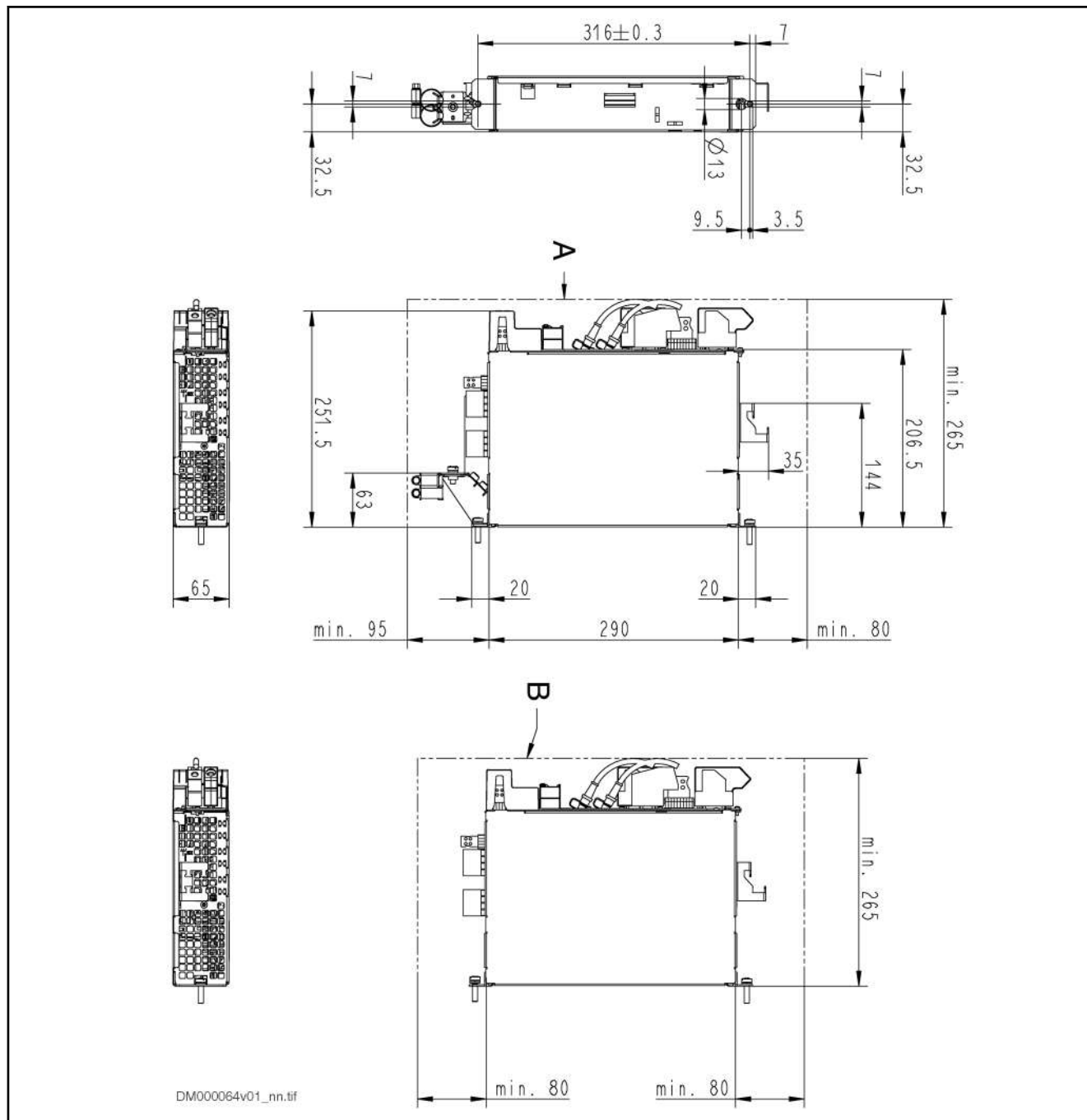
Description	Symbol	Unit	HCS02.1E- W0012-_-03	HCS02.1E- W0028-_-03	HCS02.1E- W0054-_-03	HCS02.1E- W0070-_-03
Listing in accordance with UL standard			UL 508C			
UL-Files			E134201			
Listing in accordance with CSA standard			C22.2 No. 274-13			
Last modification: 2017-01-23						

Tab. 5-4: HCS - Applied Standards

Power sections for converters - IndraDrive C

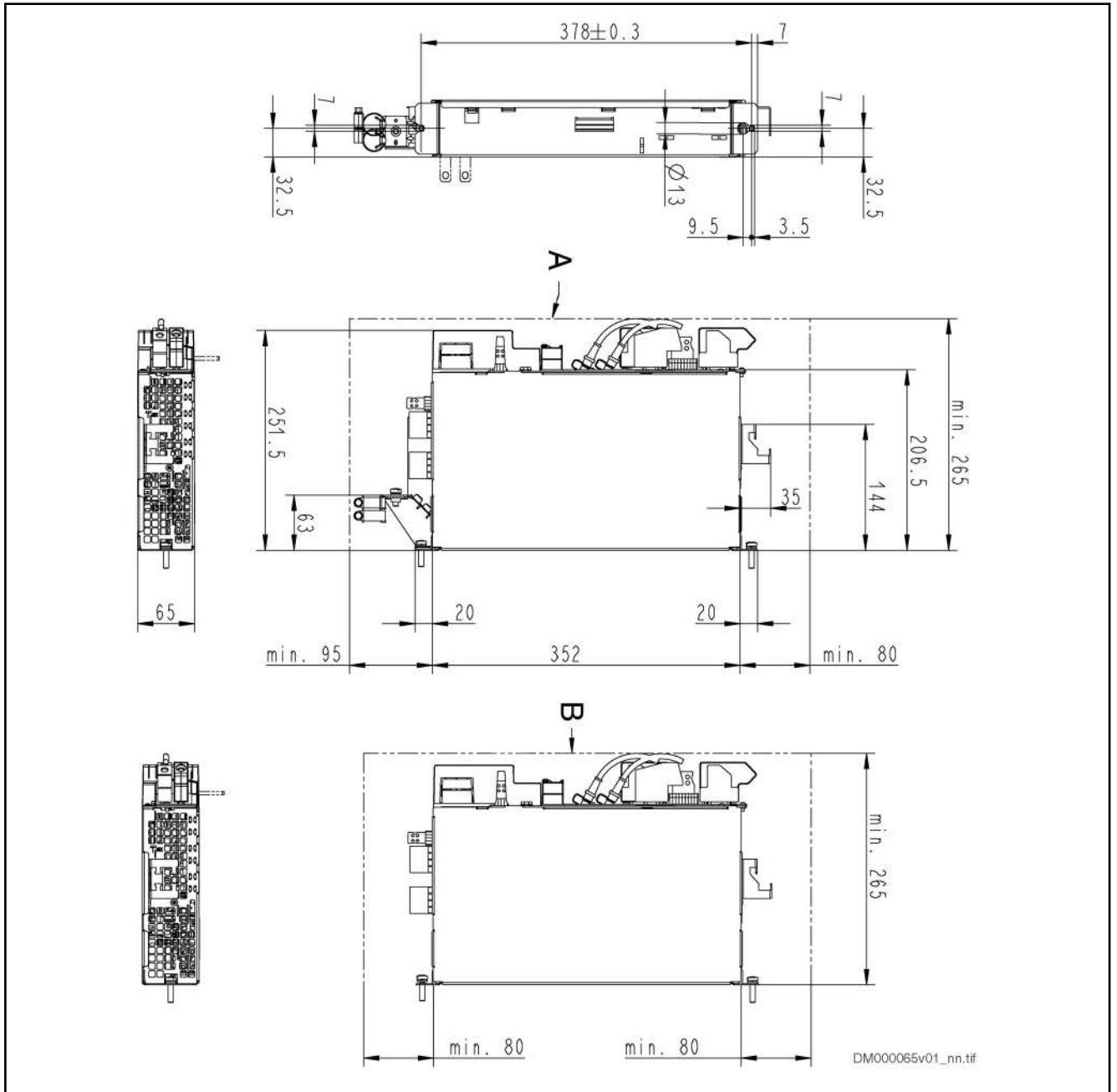
Mechanics and mounting**Dimensional drawings**

Dimensional drawing HCS02.1E-W0012



- A** Minimum mounting clearance (when using accessory HAS02.1); plus additional space for cable
- B** minimum mounting clearance; plus additional space for cable
- Fig. 5-11: Dimensional drawing HCS02.1E-W0012

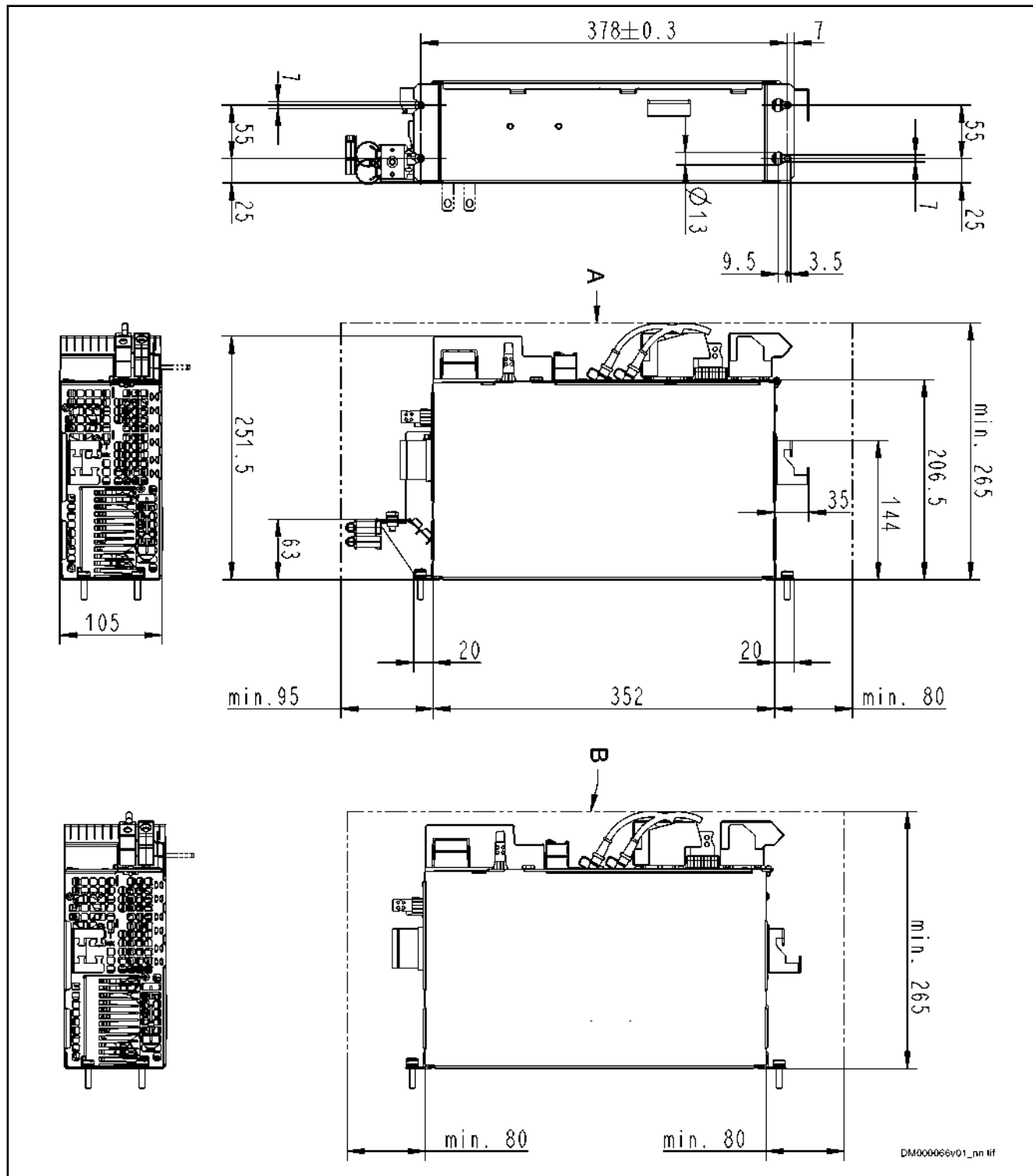
Dimensional drawing HCS02.1E-W0028



A Minimum mounting clearance (when using accessory HAS02.1); plus additional space for cable
B minimum mounting clearance; plus additional space for cable
 Fig. 5-12: Dimensional drawing HCS02.1E-W0028

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Dimensional drawing HCS02.1E-W0054/70



- A** Minimum mounting clearance (when using accessory HAS02.1); plus additional space for cable
- B** Minimum mounting clearance; plus additional space for cable

Fig. 5-13:

Dimensional drawing HCS02.1E-W0054 and HCS02.1E-W0070

Dimensions, mass, insulation, sound pressure level

Data for mass, sound pressure level, insulation

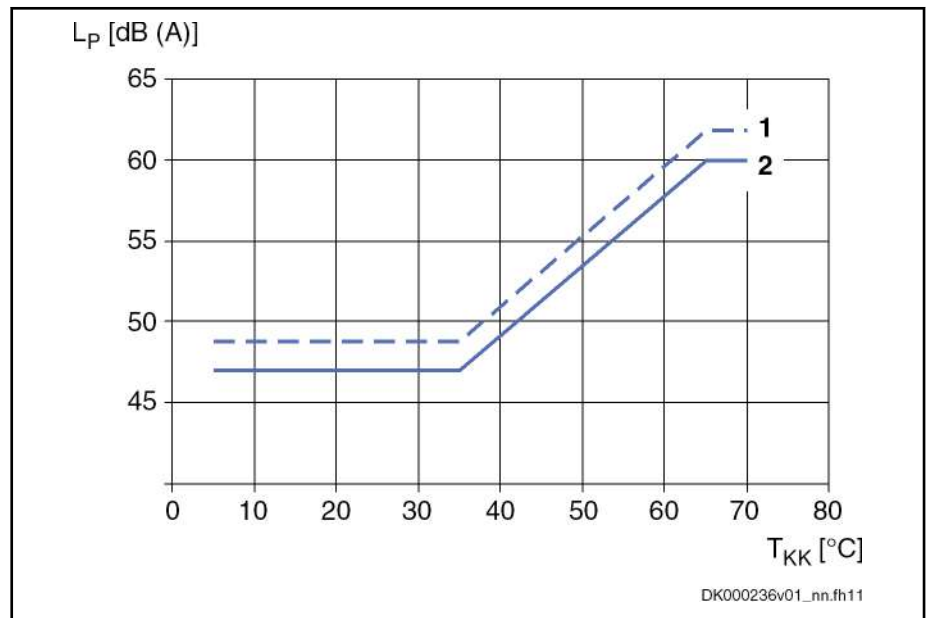
Description	Symbol	Unit	HCS02.1E-W0012-_-03	HCS02.1E-W0028-_-03	HCS02.1E-W0054-_-03	HCS02.1E-W0070-_-03
Mass	m	kg	2.90	3.80	6.70	6.80
Device height ¹⁾	H	mm	290	352		
Device depth ²⁾	T	mm	206			
Device width ³⁾	B	mm	65		105	
Insulation resistance at 500 V DC	R _{is}	MOhm	1.00	8.00		
Capacitance against housing	C _Y	nF	2 x 100			
Average sound pressure level (accuracy class 2) at P _{DC_cont} ⁴⁾	L _P	dB (A)	60		61	
Last modification: 2010-08-04						

1) 2) 3) Housing dimension; see also related dimensional drawing
 4) According to DIN EN ISO 11205; comparative value at distance 1 m, out of cabinet; HCS types with order code -L***: load-dependent

Tab. 5-5: HCS - Data for mass, dimensions, sound pressure level, insulation

Temperature-dependent fan control

In devices of the order code "-L***", the internal fan of the cooling system is controlled depending on the temperature of the cooling system. As the load increases, the temperature at the heat sink rises and thereby the sound pressure level according to the characteristic below. The specified "average sound pressure level L_P" applies to operation under rated conditions.



T_{KK} temperature at heat sink
 L_P average sound pressure level
 1 HCS02.1E-W0054/W0070-...-L***
 2 HCS02.1E-W0012/W0028-...-L***

Fig. 5-14: Characteristic of Sound Pressure Level for HCS02 with Order Code "-L***"

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Power dissipation, mounting position, cooling, distances

Cooling and power dissipation data

Description	Symbol	Unit	HCS02.1E- W0012-_-03	HCS02.1E- W0028-_-03	HCS02.1E- W0054-_-03	HCS02.1E- W0070-_-03
Ambient temperature range for operation with nominal data	T_{a_work}	°C	0...40			
Ambient temperature range for operation with reduced nominal data	$T_{a_work_red}$	°C	0...55			
	f_{Ta}	%/K	2.0			
Allowed mounting position			G1			
Cooling type			Forced ventilation			
Volumetric capacity of forced cooling	V	m ³ /h	Approx. 24		Approx. 40	
Allowed switching frequencies ¹⁾	f_s	kHz	4, 8, 12, 16			
Power dissipation at $I_{out_cont} = 0$ A; $f_s = f_s$ (min.) ²⁾	$P_{Diss_0A_fs_min}$	W	25	35	85	
Power dissipation at $I_{out_cont} = 0$ A; $f_s = f_s$ (max.) ³⁾	$P_{Diss_0A_fs_max}$	W	70	110	195	185
Power dissipation at continuous current and continuous DC bus power respectively ⁴⁾	P_{Diss_cont}	W	80.00	130.00	270.00	300.00
Minimum distance on the top of the device ⁵⁾	d_{top}	mm	80			
Minimum distance on the bottom of the device ⁶⁾	d_{bot}	mm	80			
Temperature increase with minimum distances d_{bot} ; d_{top} ; P_{BD}	ΔT	K	12	40		50

Last modification: 2014-09-23

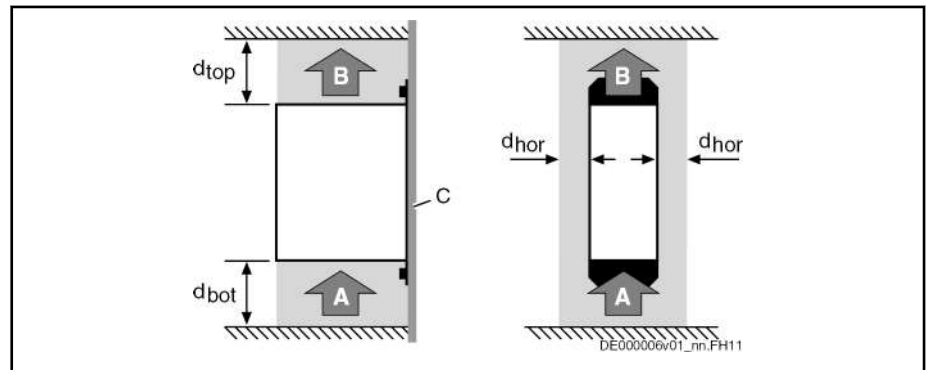
- 1) Also depending on firmware and control section; see parameter description "P-0-0001, Switching frequency of the power output stage"; see "P-0-4058, Amplifier type data"; for supply units the switching frequency is 4.2 kHz
- 2) 3) Plus dissipation of braking resistor and control section; find interim values by interpolation to P_{Diss_cont}
- 4) Plus dissipation of braking resistor and control section
- 5) 6) See fig. "Air intake and air outlet at device"
- Tab. 5-6: HCS - Data for cooling and power dissipation

NOTICE Property damage due to temperatures higher than 105 °C!

Observe the indicated minimum distances!

Above the devices there may only be such materials which

- are not combustible
- are insensitive to the occurring high temperatures



- A Air intake
- B Air outlet
- C Mounting surface in control cabinet
- d_{top} Distance top
- d_{bot} Distance bottom
- d_{hor} Distance horizontal

Fig. 5-15: Air intake and air outlet at device

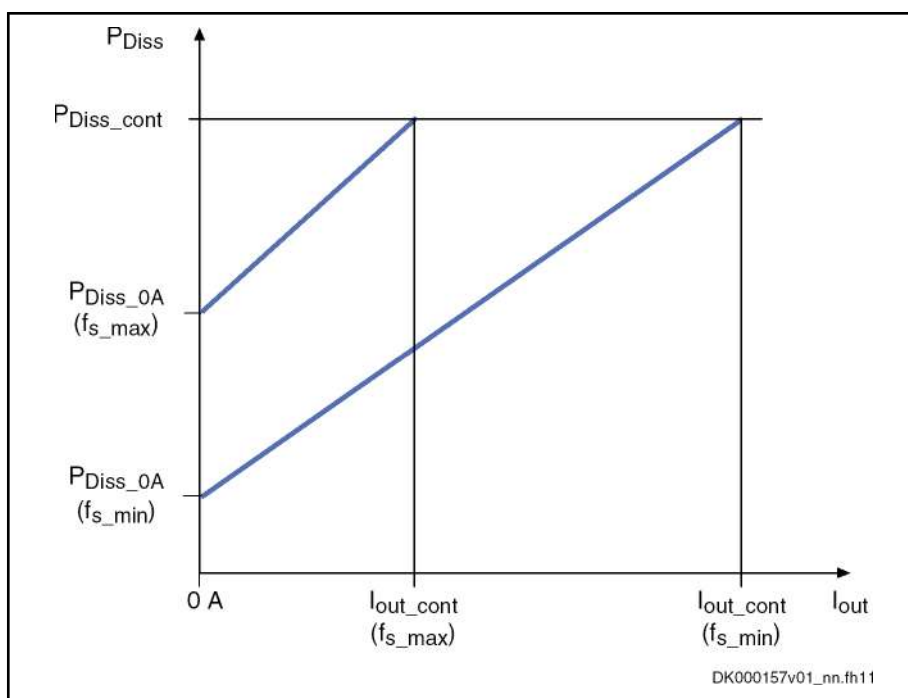
Power dissipation vs. output current

The figure below illustrates the connection between power dissipation and output current, depending on the switching frequency f_s which was set at the drive controller. See also Parameter Description "P-0-0001, Switching frequency of the power output stage".



In addition, take the power at the braking resistor and the power consumption of the control section into account. Both powers are not contained in the figure.

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I_{out} Output current
 P_{Diss} Power dissipation
 f_s Switching frequency

Fig. 5-16: Power Dissipation vs. Output Current

For the data P_{Diss_cont} , $P_{Diss_0A_f_{s_max}}$ and $P_{Diss_0A_f_{s_min}}$, see the table "Data for Cooling and Power Dissipation".

Basic data power section HCS02

General information

This section contains

- Data for control voltage supply
- Data for mains voltage supply
- Data of DC bus
- Data of integrated braking resistor and requirements on an external braking resistor
- Data of inverter
- Data for cooling and power dissipation



The order of the data tables below follows the energy flow in the drive controller - from mains connection to motor output.

Control voltage

Control voltage supply data

Description	Symbol	Unit	HCS02.1E- W0012-_-03	HCS02.1E- W0028-_-03	HCS02.1E- W0054-_-03	HCS02.1E- W0070-_-03
Control voltage input ¹⁾	U_{N3}	V	24 ± 20%			
Control voltage when using motor holding brake with motor cable length less than 50 m (HCS01 less than 40 m) ²⁾	U_{N3}	V	24 ± 5 %			
Control voltage when using motor holding brake with motor cable length more than 50 m (HCS01 more than 40 m) ³⁾	U_{N3}	V	26 ± 5 %			
Max. inrush current at 24 V supply	I_{IN3_max}	A	2.80			
Pulse width of I_{EIN3}	$t_{EIN3Lade}$	ms	15			
Input capacitance	C_{N3}	mF	0.56			
Rated power consumption control voltage input at U_{N3} ⁴⁾	P_{N3}	W	12	14	23	
Last modification: 2010-08-04						

1) 2) 3)
4)

Observe supply voltage for motor holding brakes
See information on "Rated power consumption control voltage input at U_{N3} "

Tab. 5-7: HCS - Control voltage supply data



Rated power consumption control voltage input at U_{N3}

Plus motor holding brake and control section, plus safety option



HCS02/HCS03 converters of the **design "-N**V"** have an **integrated 24V supply**. In applications without motor holding brake and with CSB01.1N-FC control section, they can be operated without external 24V supply. Observe the notes on project planning for the mains connection.

Mains voltage

Mains voltage supply data

Description	Symbol	Unit	HCS02.1E- W0012-_-03	HCS02.1E- W0028-_-03	HCS02.1E- W0054-_-03	HCS02.1E- W0070-_-03
Mains frequency	f_{LN}	Hz	50..60			
Mains frequency tolerance		Hz	± 2			
Maximum allowed mains frequency change	$\Delta f_{LN}/\Delta t$	Hz/s	-			
Rotary field condition			None			
Short circuit current rating	SCCR	A rms	42000			
Last modification: 2013-11-26						

Power sections for converters - IndraDrive C

Description	Symbol	Unit	HCS02.1E- W0012-_-03	HCS02.1E- W0028-_-03	HCS02.1E- W0054-_-03	HCS02.1E- W0070-_-03
Nominal mains voltage	U_{LN_nenn}	V	3 AC 400			
Single-phase mains voltage	U_{LN}	V	200...250			
Three-phase mains voltage at TN-S, TN-C, TT mains	U_{LN}	V	200...500			
Three-phase mains voltage at IT mains ¹⁾	U_{LN}	V	200...230			
Three-phase mains voltage at Corner-grounded-Delta mains ²⁾	U_{LN}	V	200...230			
Tolerance rated input voltage U_{LN}		%	± 10			
Minimum short circuit power of the mains for failure-free operation	S_{k_min}	MVA	0.2	0.4	0.6	0.8
Minimum inductance of mains supply (mains phase inductance) ³⁾	L_{min}	µH	40			
Assigned type of mains choke			HNL01.1E-1000-N0012-A-500-NNNN		HNL01.1E-1000-N0020-A-500-NNNN	HNL01.1E-0600-N0032-A-500-NNNN
Inrush current	$I_{L_trans_max_on}$	A	1.4...4.3	3.5...10.7	6.3...19.3	9.9...27.5
Maximum allowed ON-OFF cycles per minute ⁴⁾			1			
Mains input continuous current at U_{LN_nenn} and P_{DC_cont} (single-phase, without mains choke) ⁵⁾	I_{LN}	A	-			
Mains input continuous current at U_{LN_nenn} and P_{DC_cont} (three-phase, without mains choke) ⁶⁾	I_{LN}	A	6.00	13.00	20.00	30.00
Mains input continuous current at U_{LN_nenn} and P_{DC_cont} (single-phase, with mains choke) ⁷⁾	I_{LN}	A	-			
Mains input continuous current at U_{LN_nenn} and P_{DC_cont} (three-phase, with mains choke) ⁸⁾	I_{LN}	A	-			
Nominal current AC1 for mains contactor at nom. data			I LN			
Mains fuse according to EN 60204-1 (single-phase, without mains choke)		A	-			
Mains fuse according to EN 60204-1 (three-phase, without mains choke)		A	tbd			

Last modification: 2013-11-26

Power sections for converters - IndraDrive C

Description	Symbol	Unit	HCS02.1E- W0012-_-03	HCS02.1E- W0028-_-03	HCS02.1E- W0054-_-03	HCS02.1E- W0070-_-03
Mains fuse according to EN 60204-1 (single-phase, with mains choke)		A	-			
Mains fuse according to EN 60204-1 (three-phase, with mains choke)		A	10	16	25	35
Required wire size in accordance with NFPA 79 and UL 508 A (internal wiring); ⁹⁾	A_{LN}	AWG	14 AWG		12 AWG	10 AWG
Mains connection power at U_{LN_nenn} and P_{DC_cont} (three-phase, without mains choke)	S_{LN}	kVA	3.50	8.50	11.00	16.00
Mains connection power at U_{LN_nenn} and P_{DC_cont} (three-phase, with mains choke)	S_{LN}	kVA	3.50	7.30	13.30	18.50
Mains connection power at U_{LN_nenn} and P_{DC_cont} (single-phase, without mains choke)	S_{LN}	kVA	-			
Mains connection power at U_{LN_nenn} and P_{DC_cont} (single-phase, with mains choke)	S_{LN}	kVA	-			
Power factor TPF (λ_L) at U_{LN_nenn} and P_{DC_cont} (single-phase, without mains choke) ¹⁰⁾	TPF		0.40			
Power factor TPF (λ_L) at U_{LN_nenn} and P_{DC_cont} (three-phase, without mains choke) ¹¹⁾	TPF		0.60		0.64	0.56
Power factor TPF (λ_L) at U_{LN_nenn} and P_{DC_cont} (single-phase, with mains choke) ¹²⁾	TPF		-			
Power factor TPF (λ_L) at U_{LN_nenn} and P_{DC_cont} (three-phase, with mains choke) ¹³⁾	TPF		-	0.70	0.75	0.76
Power factor TPF (λ_L) at U_{LN_nenn} and 10% P_{DC_cont} (single-phase, without mains choke)	$TPF_{10\%}$		-			
Power factor TPF (λ_L) at U_{LN_nenn} and 10% P_{DC_cont} (three-phase, without mains choke)	$TPF_{10\%}$		0.40			
Power factor TPF (λ_L) at U_{LN_nenn} and 10% P_{DC_cont} (single-phase, with mains choke)	$TPF_{10\%}$		-			

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Description	Symbol	Unit	HCS02.1E- W0012-_-03	HCS02.1E- W0028-_-03	HCS02.1E- W0054-_-03	HCS02.1E- W0070-_-03
Power factor TPF (λ_L) at U_{LN_nenn} and 10% P_{DC_cont} (three-phase, with mains choke)	TPF _{10%}				-	
Power factor of fundamental component DPF at P_{DC_cont} (single-phase, without mains choke)	$\cos\phi^{h1}$				-	
Power factor of fundamental component DPF at P_{DC_cont} (three-phase, without mains choke)	$\cos\phi^{h1}$				0.97	
Power factor of fundamental component DPF at P_{DC_cont} (single-phase, with mains choke)	$\cos\phi^{h1}$				-	
Power factor of fundamental component DPF at P_{DC_cont} (three-phase, with mains choke)	$\cos\phi^{h1}$				0.95	

Last modification: 2013-11-26

1) 2)

Mains voltage $> U_{LN}$: Use a transformer with grounded neutral point, do not use autotransformers!

3)

Otherwise use HNL mains choke

4)

Observe allowed number of switch-on processes; without external capacitors at the DC bus

5) 6) 7) 8) 10) 11) 12) 13)

Find interim values by interpolation

9)

Copper wire; PVC-insulation (conductor temperature $90\text{ }^\circ\text{C}$; $T_a \leq 40\text{ }^\circ\text{C}$) in accordance with NFPA 79 chapter 12 and UL 508A chapter 28

Tab. 5-8:

HCS - Mains voltage supply data

DC bus**Power section data - DC bus**

Description	Symbol	Unit	HCS02.1E- W0012-_-03	HCS02.1E- W0028-_-03	HCS02.1E- W0054-_-03	HCS02.1E- W0070-_-03
DC bus voltage	U_{DC}	V	ULN x 1.41			
Capacitance in DC bus	C_{DC}	mF	0.14	0.27	0.54	0.68
DC-resistance in DC bus (L+ to L-)	R_{DC}	kOhm	Approx. 300	Approx. 150	Approx. 75	Approx. 60
Rated power ($t > 10$ min) at $f_s = 4$ kHz; U_{LN_nenn} ; control factor $a_0 > 0.8$; with mains choke	P_{DC_cont}	kW	2.10	5.10	10.00	14.00
Rated power ($t > 10$ min) at $f_s = 4$ kHz; U_{LN_nenn} ; control factor $a_0 > 0.8$; without mains choke	P_{DC_cont}	kW	2.10	5.10	7.00	9.00
P_{DC_cont} and P_{DC_max} vs. mains input voltage; $U_{LN} \leq U_{LN_nenn}$		%V	PDC_cont (ULN) = PDC_cont x [1 - (400-ULN) x 0,0025]			

Last modification: 2010-08-04

Power sections for converters - IndraDrive C

Description	Symbol	Unit	HCS02.1E-W0012-_-03	HCS02.1E-W0028-_-03	HCS02.1E-W0054-_-03	HCS02.1E-W0070-_-03
P_{DC_cont} and P_{DC_max} vs. mains input voltage; $U_{LN} > U_{LN_nenn}$		%/V	$P_{DC_cont} (ULN) = P_{DC_cont} \times [1 + (ULN-400) \times 0,002]$			
Maximum allowed DC bus power at U_{LN_nenn} ; with mains choke	P_{DC_max}	kW	5.00	10.00	16.00	19.00
Maximum allowed DC bus power at U_{LN_nenn} ; without mains choke	P_{DC_max}	kW	5.00	8.00	12.00	14.00
Balancing factor for P_{DC_cont} (for parallel operation at common DC bus) with mains choke			-	0.80		
Balancing factor for P_{DC_cont} (for parallel operation at common DC bus) without mains choke			-	0.50		
Monitoring value maximum DC bus voltage, switch-off threshold	$U_{DC_limit_max}$	V	900			
Monitoring value minimum DC bus voltage, undervoltage threshold	$U_{DC_limit_min}$	V	can be parameterized, see "P-0-0114, Undervoltage threshold"			
Charging resistor continuous power	P_{DC_Start}	kW	0.05	0.15	0.35	0.50
Allowed external DC bus capacitance (nom.) at U_{LN_nenn} ¹⁾	C_{DCext}	mF	-	5.00	7.00	13.00
Charging time at maximum allowed C_{DCext} external DC bus capacitance at U_{LN_nenn}	$t_{lade_DC_Cext}$	s	2.00			
Last modification: 2010-08-04						

1) Use assigned mains choke
 Tab. 5-9: HCS - Power section data - DC bus

Single-phase mains connection



Single-phase mains connection

Single-phase mains connection is carried out via the connections L1 and L2.

The maximum allowed DC bus power P_{DC_max} is limited to the specified continuous power $P_{DC_cont_1ph}$.

Data of power section with single-phase mains connection

Description	Symbol	Unit	HCS02.1E-W0012-_-03	HCS02.1E-W0028-_-03	HCS02.1E-W0054-_-03	HCS02.1E-W0070-_-03
Single-phase mains voltage	U_{LN}	V	200...250			
continuous power (t > 10 min)	$P_{DC_cont_1ph}$	W	50...70	100...160	150...250	260...400

Tab. 5-10: HCS - Data of power section with single-phase mains connection

Power sections for converters - IndraDrive C

Braking resistor**Integrated braking resistor****Integrated braking resistor data**

Description	Symbol	Unit	HCS02.1E- W0012-_-03	HCS02.1E- W0028-_-03	HCS02.1E- W0054-_-03	HCS02.1E- W0070-_-03
Braking resistor continuous power	P_{BD}	kW	0.05	0.15	0.35	0.50
Braking resistor peak power	P_{BS}	kW	4.00	10.00	18.00	25.00
Nominal braking resistor	$R_{DC_Bleed-er}$	ohm	180	72	40	28
Braking resistor switch-on threshold - independent of mains voltage ¹⁾	$U_{R_DC_On_f}$	V	820; see also "P-0-0833, Braking resistor threshold" and "P-0-0860, Converter configuration"			
Braking resistor switch-on threshold - depending on mains voltage ²⁾	$U_{R_DC_On_v}$		see "P-0-0833, Braking resistor threshold" and "P-0-0860, Converter configuration"			
Maximum allowed on-time duty	t_{on_max}	s	0.25	0.50		
Minimum allowed cycle time	T_{cycl}	s	20.00	33.00	26.00	25.00
Regenerative power to be absorbed	W_{R_max}	kWs	1.00	5.00	9.00	13.00
Balancing factor for P_{BD} (for parallel operation at common DC bus)	f		-	0.80		
Cooling of integrated braking resistor			Forced			
Last modification: 2010-08-04						

1) 2) Factory setting

Tab. 5-11: HCS - Integrated braking resistor data

External braking resistor**Requirements on external braking resistor**

Description	Symbol	Unit	HCS02.1E- W0012-_-03	HCS02.1E- W0028-_-03	HCS02.1E- W0054-_-03	HCS02.1E- W0070-_-03
Resistance value of external braking resistor ¹⁾	$R_{DC_Bleed-er}$	ohm	-		40.0	28.0
Assigned braking resistor type HLR01 ²⁾			-		HLR01.1N-01 K8-N40R0; HLR01.1N-03 K8-N40R0	HLR01.1N-02 K4-N28R0; HLR01.1N-05 K5-N28R0
Last modification: 2010-08-04						

1) See Parameter Description "P-0-0858, Data of external braking resistor"

2) See also Project Planning Manual "Additional Components"

Tab. 5-12: HCS - Requirements on external braking resistor

Inverter

Power section data - inverter

Description	Symbol	Unit	HCS02.1E- W0012-_-03	HCS02.1E- W0028-_-03	HCS02.1E- W0054-_-03	HCS02.1E- W0070-_-03
Allowed switching frequencies ¹⁾	f_s	kHz	4, 8, 12, 16			
Output voltage, fundamental wave for V/Hz (U/f) control	U_{out_eff}	V	~ UDC x 0.71			
Output voltage, fundamental wave for closed-loop operation	U_{out_eff}	V	~ UDC * 0,71			
Rise of voltage at output with U_{LN_nenn} and 15 m motor cable length phase-phase (10-90%) ²⁾	dv/dt	kV/ μ s	5.00			
Rise of voltage at output with U_{LN_nenn} and 15 m motor cable length phase-ground (10-90%) ³⁾	dv/dt	kV/ μ s	5.00			
Output frequency range when $f_s = 2$ kHz	f_{out_2k}	Hz	-			
Output frequency range when $f_s = 4$ kHz	f_{out_4k}	Hz	0...400			
Output frequency range when $f_s = 8$ kHz	f_{out_8k}	Hz	0..800			
Output frequency range when $f_s = 12$ kHz	f_{out_12k}	Hz	0..1200			
Output frequency range when $f_s = 16$ kHz	f_{out_16k}	Hz	0...1600			
Output frequency threshold for detecting motor standstill ⁴⁾	f_{out_still}	Hz	2...4			
Maximum output current when $f_s = 2$ kHz	I_{out_max2}	A	-			
Maximum output current when $f_s = 4$ kHz	I_{out_max4}	A	11.5	28.3	54.0	70.8
Maximum output current when $f_s = 8$ kHz	I_{out_max8}	A	11.5	28.3	54.0	70.8
Maximum output current when $f_s = 12$ kHz	I_{out_max12}	A	11.5	28.3	54.0	70.8
Maximum output current when $f_s = 16$ kHz	I_{out_max16}	A	11.5	28.3	54.0	70.8
Continuous output current when $f_s = 2$ kHz	I_{out_cont2}	A	-			
Continuous output current when $f_s = 4$ kHz	I_{out_cont4}	A	4.5	12.0	20.6	28.0
Last modification: 2010-08-04						

Power sections for converters - IndraDrive C

Description	Symbol	Unit	HCS02.1E- W0012-_-03	HCS02.1E- W0028-_-03	HCS02.1E- W0054-_-03	HCS02.1E- W0070-_-03
Continuous output current when $f_s = 8$ kHz	I_{out_cont8}	A	4.5	9.2	20.6	21.4
Continuous output current when $f_s = 12$ kHz ⁵⁾	I_{out_cont12}	A	4.0	5.1	13.8	14.1
Continuous output current when $f_s = 16$ kHz ⁶⁾	I_{out_cont16}	A	2.8	4.4	11.1	10.5
Continuous output current when $f_s = 2$ kHz; output frequency f_{out} less than f_{out_still}	$I_{out_cont0Hz_2}$	A	-			
Continuous output current when $f_s = 4$ kHz; output frequency f_{out} less than f_{out_still}	$I_{out_cont0Hz_4}$	A	4.5	9.7	20.2	
Continuous output current when $f_s = 8$ kHz; output frequency f_{out} less than f_{out_still}	$I_{out_cont0Hz_8}$	A	3.3	5.6	13.1	11.9
Continuous output current when $f_s = 12$ kHz; output frequency f_{out} less than f_{out_still} ⁷⁾	$I_{out_cont0Hz_12}$	A	1.2	2.3	7.5	6.7
Continuous output current when $f_s = 16$ kHz; output frequency f_{out} less than f_{out_still} ⁸⁾	$I_{out_cont0Hz_16}$	A	0.7	2.1	6.1	4.2
Assigned output filters at nom. data; $f_s = 4$ kHz			HMF01,1A-N0K2-M0012		HMF01,1A-N0K2-M0028	
Last modification: 2010-08-04						

- 1) Also depending on firmware and control section; see parameter description "P-0-0001, Switching frequency of the power output stage"; see "P-0-4058, Amplifier type data"; for supply units the switching frequency is 4.2 kHz
- 2) 3) Guide value, see following note
- 4) See following note regarding output current reduction
- 5) 6) 7) 8) See parameter description "P-0-0556, Config word of axis controller", load-dependent reduction of switching frequency f_s

Tab. 5-13: HCS - Power section data - inverter



Guide value "Rise of voltage at output"

Observe that the voltage load at the motor is almost independent of the power section used.

Especially when using **standard motors**, make sure that they comply with the occurring voltage load.

Observe the information on third-party motors at drive controllers (see documentation "Rexroth IndraDrive Drive Systems With HMV01/02 HMS01/02, HMD01, HCS02/03", index entry "Third-party motors → On drive controllers").

**Reduced output current at motor standstill**

Depending on the electric output frequency, the output current is reduced for thermal protection of the power section.

The output current is reduced, when the electric output frequency has fallen below the threshold to detect motor standstill.

Exemplary data for applications**General information**

This section contains

- Examples of allowed current profiles
- Examples of allowed performance profiles
- Data for selecting standard motors

Current profiles**Examples of allowed current profiles**

Description	Symbol	Unit	HCS02.1E-W0012-_-03	HCS02.1E-W0028-_-03	HCS02.1E-W0054-_-03	HCS02.1E-W0070-_-03
Maximum output current at $I_{out_base_1}$; $f_s = 2$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5^1$	$I_{out_peak1_2}$	A	-			
Base load current at $I_{out_peak_1}$; $f_s = 2$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5$	$I_{out_base1_2}$	A	-			
Maximum output current at $I_{out_base_1}$; $f_s = 4$ kHz; $t = 0,4$ s; $T = 4$ s; $K = 2,5^2$	$I_{out_peak1_4}$	A	9.07	24.29	41.66	56.56
Base load current at $I_{out_peak_1}$; $f_s = 4$ kHz; $t = 0,4$ s; $T = 4$ s; $K = 2,5$	$I_{out_base1_4}$	A	3.63	9.72	16.66	22.62
Maximum output current at $I_{out_base_1}$; $f_s = 8$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5^3$	$I_{out_peak1_8}$	A	9.07	15.06	33.59	34.77
Base load current at $I_{out_peak_1}$; $f_s = 8$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5$	$I_{out_base1_8}$	A	3.63	6.02	13.43	13.91
Maximum output current at $I_{out_base_1}$; $f_s = 12$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5^4$	$I_{out_peak1_12}$	A	6.03	8.42	21.96	23.12
Base load current at $I_{out_peak_1}$; $f_s = 12$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5$	$I_{out_base1_12}$	A	2.41	3.37	8.78	9.25
Maximum output current at $I_{out_base_1}$; $f_s = 16$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5^5$	$I_{out_peak1_16}$	A	4.25	7.29	17.77	17.16

Last modification: 2010-08-04

Power sections for converters - IndraDrive C

Description	Symbol	Unit	HCS02.1E- W0012-_-03	HCS02.1E- W0028-_-03	HCS02.1E- W0054-_-03	HCS02.1E- W0070-_-03
Base load current at $I_{out_peak_1}$; $f_s = 16$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5$	$I_{out_base1_1}$ 6	A	1.70	2.92	7.11	6.86
Maximum output current at $I_{out_base_3}$; $f_s = 2$ kHz; $t = 2$ s; $T = 20$ s; $K = 2.0^{(6)}$	$I_{out_peak3_2}$	A	-			
Base load current at $I_{out_peak_3}$; $f_s = 2$ kHz; $t = 2$ s; $T = 20$ s; $K = 2.0$	$I_{out_base3_2}$	A	-			
Maximum output current at $I_{out_base_3}$; $f_s = 4$ kHz; $t = 2$ s; $T = 20$ s; $K = 2.0^{(7)}$	$I_{out_peak3_4}$	A	7.79	20.90	35.86	48.68
Base load current at $I_{out_peak_3}$; $f_s = 4$ kHz; $t = 2$ s; $T = 20$ s; $K = 2.0$	$I_{out_base3_4}$	A	3.90	10.45	17.93	24.34
Maximum output current at $I_{out_base_3}$; $f_s = 8$ kHz; $t = 2$ s; $T = 20$ s; $K = 2.0^{(8)}$	$I_{out_peak3_8}$	A	7.79	13.55	30.54	31.36
Base load current at $I_{out_peak_3}$; $f_s = 8$ kHz; $t = 2$ s; $T = 20$ s; $K = 2.0$	$I_{out_base3_8}$	A	3.90	6.77	15.27	15.68
Maximum output current at $I_{out_base_3}$; $f_s = 12$ kHz; $t = 2$ s; $T = 20$ s; $K = 2.0^{(9)}$	$I_{out_peak3_1}$ 2	A	5.57	7.56	19.88	20.81
Base load current at $I_{out_peak_3}$; $f_s = 12$ kHz; $t = 2$ s; $T = 20$ s; $K = 2.0$	$I_{out_base3_1}$ 2	A	2.78	3.78	9.94	10.40
Maximum output current at $I_{out_base_3}$; $f_s = 16$ kHz; $t = 2$ s; $T = 20$ min; $K = 2.0^{(10)}$	$I_{out_peak3_1}$ 6	A	3.90	6.55	16.06	15.42
Base load current at $I_{out_peak_3}$; $f_s = 16$ kHz; $t = 2$ s; $T = 20$ s; $K = 2.0$	$I_{out_base3_1}$ 6	A	1.95	3.27	8.03	7.71
Base load current at $I_{out_peak_4}$; $f_s = 2$ kHz; $t = 60$ s; $T = 5$ min; $K = 1.5$	$I_{out_base4_2}$	A	-			
Maximum output current at $I_{out_base_4}$; $f_s = 2$ kHz; $t = 60$ s; $T = 5$ min; $K = 1.5^{(11)}$	$I_{out_peak4_2}$	A	-			
Maximum output current at $I_{out_base_4}$; $f_s = 4$ kHz; $t = 60$ s; $T = 5$ min; $K = 1.5^{(12)}$	$I_{out_peak4_4}$	A	5.22	14.79	25.13	33.74
Last modification: 2010-08-04						

Power sections for converters - IndraDrive C

Description	Symbol	Unit	HCS02.1E- W0012-_-03	HCS02.1E- W0028-_-03	HCS02.1E- W0054-_-03	HCS02.1E- W0070-_-03
Base load current at $I_{out_peak_4}$; $f_s = 4$ kHz; $t = 60$ s; $T = 5$ min; $K = 1,5$	$I_{out_base4_4}$	A	3.48	9.86	16.76	22.49
Maximum output current at $I_{out_base_4}$; $f_s = 8$ kHz; $t = 60$ s; $T = 5$ min; $K = 1.5^{13)}$	$I_{out_peak4_8}$	A	5.22	10.25	22.97	24.33
Base load current at $I_{out_peak_4}$; $f_s = 8$ kHz; $t = 60$ s; $T = 5$ min; $K = 1.5$	$I_{out_base4_8}$	A	3.48	6.83	15.32	16.22
Maximum output current at $I_{out_base_4}$; $f_s = 12$ kHz; $t = 60$ s; $T = 5$ min; $K = 1.5^{14)}$	$I_{out_peak4_1}$ 2	A	4.32	5.71	14.88	16.10
Base load current at $I_{out_peak_4}$; $f_s = 12$ kHz; $t = 60$ s; $T = 5$ min; $K = 1.5$	$I_{out_base4_1}$ 2	A	2.88	3.81	9.92	10.74
Maximum output current at $I_{out_base_4}$; $f_s = 16$ kHz; $t = 60$ s; $T = 5$ min; $K = 1.5^{15)}$	$I_{out_peak4_1}$ 6	A	3.02	4.95	12.00	11.93
Base load current at $I_{out_peak_4}$; $f_s = 16$ kHz; $t = 60$ s; $T = 5$ min; $K = 1.5$	$I_{out_base4_1}$ 6	A	2.01	3.30	8.00	7.95
Maximum output current at $I_{out_base_5}$; $f_s = 2$ kHz; $t = 60$ s; $T = 10$ min; $K = 1.1^{16)}$	$I_{out_peak5_2}$	A	-			
Base load current at $I_{out_peak_5}$; $f_s = 2$ kHz; $t = 60$ s; $T = 10$ min; $K = 1.1$	$I_{out_base5_2}$	A	-			
Maximum output current at $I_{out_base_5}$; $f_s = 4$ kHz; $t = 60$ s; $T = 10$ min; $K = 1,1^{17)}$	$I_{out_peak5_4}$	A	4.70	12.75	21.82	29.55
Base load current at $I_{out_peak_5}$; $f_s = 4$ kHz; $t = 60$ s; $T = 10$ min; $K = 1,1$	$I_{out_base5_4}$	A	4.27	11.59	19.84	26.87
Maximum output current at $I_{out_base_5}$; $f_s = 8$ kHz; $t = 60$ s; $T = 10$ min; $K = 1.1^{18)}$	$I_{out_peak5_8}$	A	4.70	9.46	21.79	22.20
Base load current at $I_{out_peak_5}$; $f_s = 8$ kHz; $t = 60$ s; $T = 10$ min; $K = 1.1$	$I_{out_base5_8}$	A	4.27	8.60	19.81	20.18
Maximum output current at $I_{out_base_5}$; $f_s = 12$ kHz; $t = 60$ s; $T = 10$ min; $K = 1.1^{19)}$	$I_{out_peak5_1}$ 2	A	4.14	5.27	14.10	14.68
Last modification: 2010-08-04						

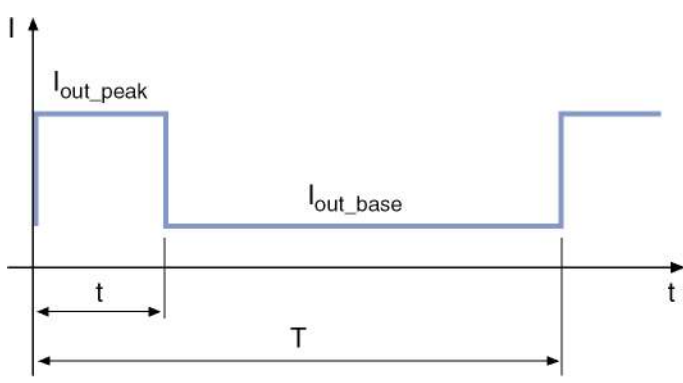
Power sections for converters - IndraDrive C

Description	Symbol	Unit	HCS02.1E- W0012-_-03	HCS02.1E- W0028-_-03	HCS02.1E- W0054-_-03	HCS02.1E- W0070-_-03
Base load current at $I_{out_peak_5}$; $f_s = 12$ kHz; $t = 60$ s; $T = 10$ min; $K = 1.1$	$I_{out_base5_1}$ 2	A	3.76	4.79	12.82	13.35
Maximum output current at $I_{out_base_5}$; $f_s = 16$ kHz; $t = 60$ s; $T = 10$ min; $K = 1.1^{20}$)	$I_{out_peak5_1}$ 6	A	2.89	4.57	11.37	10.87
Base load current at $I_{out_peak_5}$; $f_s = 16$ kHz; $t = 60$ s; $T = 10$ min; $K = 1.1$	$I_{out_base5_1}$ 6	A	2.63	4.15	10.33	9.88
Last modification: 2010-08-04						

1) 2) 3) 4) 5) 6) 7) 8) 9) 10) 11) 12) 13) 14) 15) 16) 17) 18) 19) 20) See definition profile UEL_I_e

Tab. 5-14: HCS - Examples of allowed current profiles

Current profile "UEL_I_e" The following current profiles have been defined for converters and inverters.

| Profile | Explanation |
|--|--|
| <p>current profile "UEL_I_e"</p>  <p>The graph shows a current profile over time. The vertical axis is current (I) and the horizontal axis is time (t). The profile consists of a pulse of current I_{out_peak} for a duration t, followed by a steady-state current I_{out_base} for a duration T.</p> <p style="text-align: right;">DK000149v01_nn.fh11</p> | <p>The characteristic data of the profile are used to select converters and inverters for operation with standard motors and servo drives.</p> |

Tab. 5-15: Definition of current profiles

Performance profiles

Examples of allowed performance profiles

| Description | Symbol | Unit | HCS02.1E-W0012-_-03 | HCS02.1E-W0028-_-03 | HCS02.1E-W0054-_-03 | HCS02.1E-W0070-_-03 |
|--|-------------------|------|---------------------|---------------------|---------------------|---------------------|
| maximum DC bus power at U_{LN_nenn} ; $T_a \leq T_{a_work}$; $t = 0.4$ s; $T = 4$ s; $K = 2.5$; $P_{DC_peak} = P_{DC_max}$; without mains choke ¹⁾ | $P_{DC_peak_1}$ | kW | 4.25 | 10.33 | 14.17 | 18.19 |
| maximum DC bus power at U_{LN_nenn} ; $T_a \leq T_{a_work}$; $t = 0.4$ s; $T = 4$ s; $K = 2.5$; $P_{DC_peak} = P_{DC_max}$; with mains choke ²⁾ | $P_{DC_peak_1}$ | kW | - | - | 20.24 | 28.30 |
| DC bus power at U_{LN_nenn} ; $T_a \leq T_{a_work}$; $t = 0.4$ s; $T = 4$ s; $K = 2.5$; $P_{DC_peak} = P_{DC_max}$; without mains choke ³⁾ | $P_{DC_base_1}$ | kW | 1.68 | 4.12 | 5.67 | 7.26 |
| DC bus power at U_{LN_nenn} ; $T_a \leq T_{a_work}$; $t = 0.4$ s; $T = 4$ s; $K = 2.5$; $P_{DC_peak} = P_{DC_max}$; with mains choke ⁴⁾ | $P_{DC_base_1}$ | kW | - | - | 8.11 | 11.30 |
| maximum DC bus power at U_{LN_nenn} ; $T_a \leq T_{a_work}$; $t = 2$ s; $T = 20$ s; $K = 2.0$; without mains choke ⁵⁾ | $P_{DC_peak_3}$ | kW | 3.64 | 8.88 | 12.19 | 15.65 |
| maximum DC bus power at U_{LN_nenn} ; $T_a \leq T_{a_work}$; $t = 2$ s; $T = 20$ s; $K = 2.0$; with mains choke ⁶⁾ | $P_{DC_peak_3}$ | kW | - | - | 17.41 | 24.34 |
| DC bus power at U_{LN_nenn} ; $T_a \leq T_{a_work}$; $t = 2$ s; $T = 20$ s; $K = 2.0$; without mains choke ⁷⁾ | $P_{DC_base_3}$ | kW | 1.82 | 4.44 | 6.09 | 7.82 |
| DC bus power at U_{LN_nenn} ; $T_a \leq T_{a_work}$; $t = 2$ s; $T = 20$ s; $K = 2.0$; with mains choke ⁸⁾ | $P_{DC_base_3}$ | kW | - | - | 8.70 | 12.17 |
| maximum DC bus power at bei U_{LN_nenn} ; $T_a \leq T_{a_work}$; $t = 60$ s; $T = 5$ min; $K = 1.5$; without mains choke ⁹⁾ | $P_{DC_peak_4}$ | kW | 2.44 | 6.29 | 8.54 | 10.85 |
| DC bus power at U_{LN_nenn} ; $T_a \leq T_{a_work}$; $t = 60$ s; $T = 5$ min; $K = 1.5$; with mains choke ¹⁰⁾ | $P_{DC_peak_4}$ | kW | - | - | 12.20 | 16.87 |

Last modification: 2010-08-04

Power sections for converters - IndraDrive C

| Description | Symbol | Unit | HCS02.1E-
W0012-_-03 | HCS02.1E-
W0028-_-03 | HCS02.1E-
W0054-_-03 | HCS02.1E-
W0070-_-03 |
|---|-------------------|------|-------------------------|-------------------------|-------------------------|-------------------------|
| DC bus power at U_{LN_nenn} ;
$T_a \leq T_{a_work}$; $t = 60$ s; $T = 5$ min;
$K = 1.5$; without mains choke ¹¹⁾ | $P_{DC_base_4}$ | kW | 1.62 | 4.19 | 5.70 | 7.23 |
| DC bus power at U_{LN_nenn} ;
$T_a \leq T_{a_work}$; $t = 60$ s; $T = 5$ min;
$K = 1.5$; with mains choke ¹²⁾ | $P_{DC_base_4}$ | kW | - | | 8.14 | 11.25 |
| maximum DC bus power at
U_{LN_nenn} ; $T_a \leq T_{a_work}$; $t = 60$ s;
$T = 10$ min; $K = 1.1$; without mains
choke ¹³⁾ | $P_{DC_peak_5}$ | kW | 2.19 | 5.42 | 7.41 | 9.50 |
| maximum DC bus power at
U_{LN_nenn} ; $T_a \leq T_{a_work}$; $t = 60$ s;
$T = 10$ min; $K = 1.1$; with mains
choke ¹⁴⁾ | $P_{DC_peak_5}$ | kW | - | | 10.59 | 14.78 |
| DC bus power at U_{LN_nenn} ;
$T_a \leq T_{a_work}$; $t = 60$ s; $T = 10$ min;
$K = 1.1$; without mains choke ¹⁵⁾ | $P_{DC_base_5}$ | kW | 1.99 | 4.93 | 6.74 | 8.64 |
| DC bus power at U_{LN_nenn} ;
$T_a \leq T_{a_max}$; $t = 60$ s; $T = 10$ min;
$K = 1.1$; with mains choke ¹⁶⁾ | $P_{DC_base_5}$ | kW | - | | 9.63 | 13.44 |
| Last modification: 2010-08-04 | | | | | | |

1) 2) 3) 4) 5) 6) 7) 8) 9) 10) 11) 12) 13) 14) 15) 16) See UEL_P_e profile definition

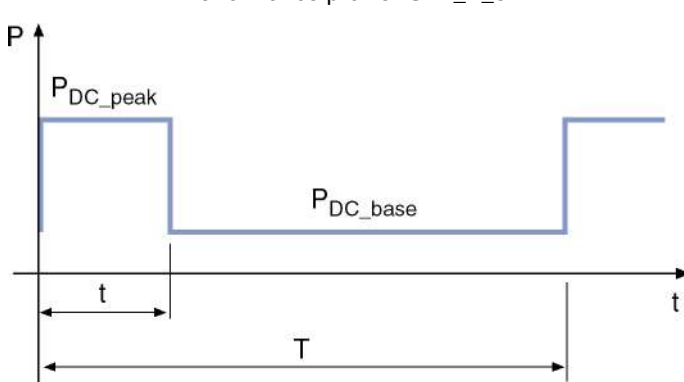
Tab. 5-16: HCS - Examples of allowed performance profiles

Performance profile "UEL_P_e"

The following performance profiles have been defined for converters and inverters.



Observe the allowed performance data P_{DC_peak} and P_{DC_base} in the corresponding performance profile of the supply unit or converter.

| Profile | Explanation |
|---|---|
| <p>Performance profile "UEL_P_e"</p>  <p>DK000135v01_nn.fh11</p> | <p>Characteristic of the selection of standard motors and servo drives.</p> |

Tab. 5-17: Definition of Performance Profiles, Infeeding Supply Units and Converters

Operation with standard motors

General information

Selecting standard motors

The tables below show the nominal powers P_{neff} of standard motors which can be operated at the respective drive controller. The following conditions apply to the data in the tables:

- Motor design:
 - 4-pole standard motor (2 pole pairs) with rated voltage 3 AC 400 V, 50 Hz at mains voltage $U_{\text{LN}} \geq 3 \text{ AC } 400 \text{ V}$ or
 - 4-pole standard motor (2 pole pairs) with rated voltage 3 AC 460 V, 60 Hz at mains voltage $U_{\text{LN}} \geq 3 \text{ AC } 460 \text{ V}$
- Assigned mains choke is used
- Operation at minimum switching frequency $f_s = f_s (\text{min.})$
- Rotary field at output with $f_{\text{out}} > f_{\text{out,still}}$
- Ambient temperature $T_a \leq T_{a,\text{work}}$
- Overload ratio $K = P_{\text{DC,peak}} / P_{\text{DC,base}}$ according to performance profile "UEL_P_e"
- Type of mains connection: Individual Supply



When choosing standard motors for inverters, select an appropriate supply unit. Observe the performance data $P_{\text{DC,peak}}$ and $P_{\text{DC,base}}$ in the performance profile "UEL_P_e" of the supply unit.

Power sections for converters - IndraDrive C

Operating standard motors at 3 AC 400 V

Selection of standard motors 3 AC 400V - Exemplary profiles

| Description | Symbol | Unit | HCS02.1E-W0012-_-03 | HCS02.1E-W0028-_-03 | HCS02.1E-W0054-_-03 | HCS02.1E-W0070-_-03 |
|---|------------|------|---------------------|---------------------|---------------------|---------------------|
| Nominal power standard motor
3 AC 400 V; 50 Hz; $t > 10$ min;
$K = 1.0$; $f_s = 4$ kHz ¹⁾ | P_{Nenn} | kW | 1.50 | 4.00 | 7.50 | 11.00 |
| Nominal power standard motor
3 AC 400 V; 50 Hz; $t = 60$ s;
$T = 10$ min; $K = 1.1$; $f_s = 4$ kHz ²⁾ | P_{Nenn} | kW | 1.50 | 4.00 | 7.50 | 11.00 |
| Nominal power standard motor
3 AC 400 V; 50 Hz; $t = 60$ s; $T = 5$
min; $K = 1.5$; $f_s = 4$ kHz ³⁾ | P_{Nenn} | kW | 1.10 | 4.00 | 5.50 | 11.00 |
| Nominal power standard motor
3 AC 400 V; 50 Hz; $t = 2$ s;
$T = 20$ s; $K = 2.0$; $f_s = 4$ kHz ⁴⁾ | P_{Nenn} | kW | 1.10 | 3.00 | 5.50 | 7.50 |
| Last modification: 2010-08-04 | | | | | | |

1) 2) 3) 4) See UEL_P_e profile definition

Tab. 5-18: HCS - Selection of standard motors 3 AC 400V - Exemplary profiles

Operating standard motors at 3 AC 460 V

Selection of standard motors 3 AC 460V - Exemplary profiles

| Description | Symbol | Unit | HCS02.1E-W0012-_-03 | HCS02.1E-W0028-_-03 | HCS02.1E-W0054-_-03 | HCS02.1E-W0070-_-03 |
|--|------------|------|---------------------|---------------------|---------------------|---------------------|
| Nominal power standard motor
3AC460V; 60 Hz; $t > 10$ min;
$K = 1,0$; $f_s = 4$ kHz ¹⁾ | P_{Nenn} | kW | 1.50 | 5.50 | 11.00 | 15.00 |
| Nominal power standard motor
3AC460V; 60 Hz; $t = 60$ s; $T = 10$
min; $K = 1.1$; $f_s = 4$ kHz ²⁾ | P_{Nenn} | kW | 1.50 | 5.50 | 11.00 | 15.00 |
| Nominal power standard motor
3AC460V; 60 Hz; $t = 60$ s; $T = 5$
min; $K = 1.5$; $f_s = 4$ kHz ³⁾ | P_{Nenn} | kW | 1.10 | 5.50 | 7.50 | 15.00 |
| Nominal power standard motor
3AC460V; 60 Hz; $t = 2$ s; $T = 20$ s;
$K = 2,0$; $f_s = 4$ kHz ⁴⁾ | P_{Nenn} | kW | 1.10 | 3.70 | 7.50 | 11.00 |
| Last modification: 2010-08-04 | | | | | | |

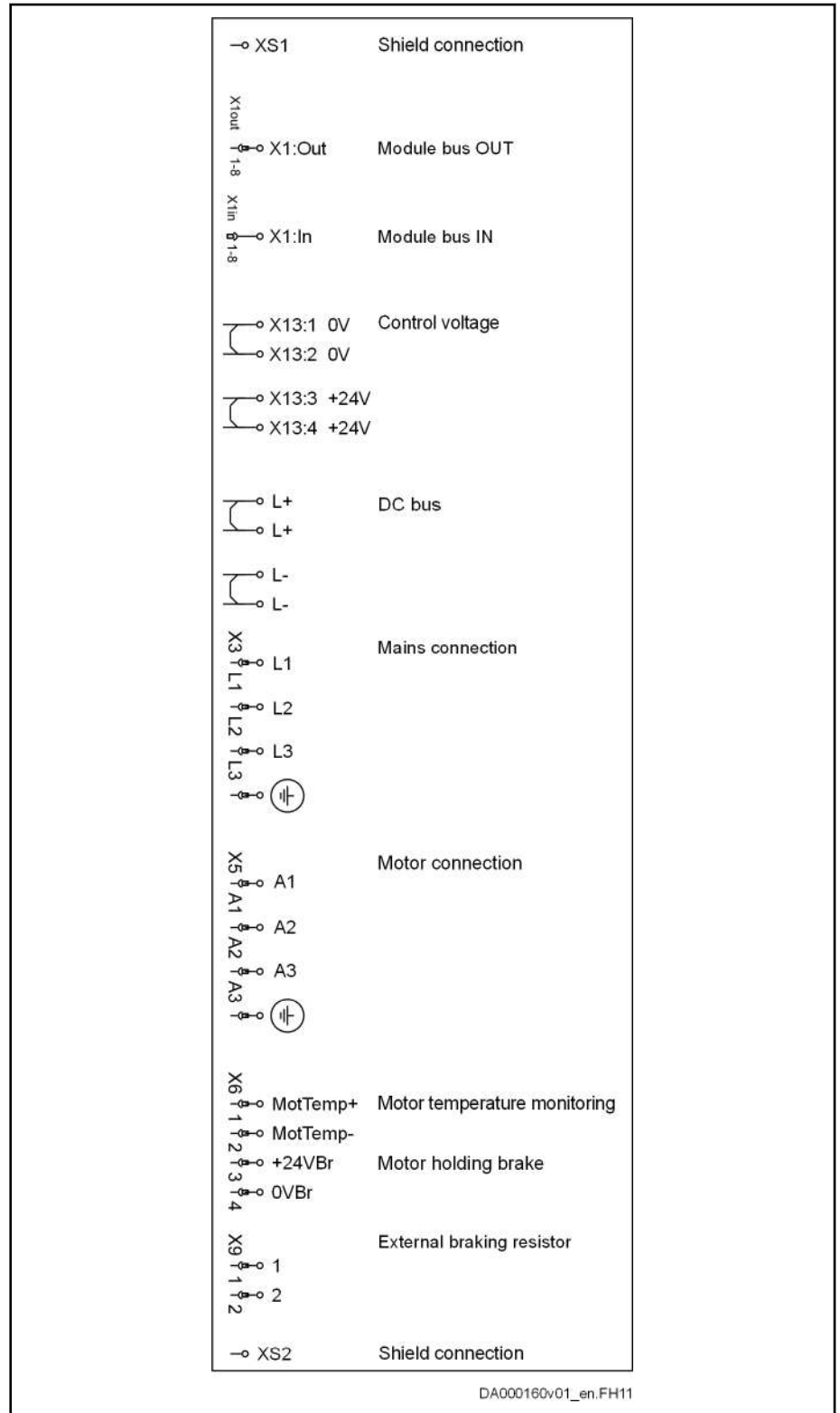
1) 2) 3) 4) See definition profile UEL_P_e; 1 kW ~ 1.36 hp

Tab. 5-19: HCS - Selection of standard motors 3 AC 460V - Exemplary profiles

5.2.5 Connections and interfaces

Overview

Overall connection diagram



X1, L+/L- Not available for HCS02.1E-W0012

Power sections for converters - IndraDrive C

X9 Not available for HCS02.1E-W0012 and -W0028

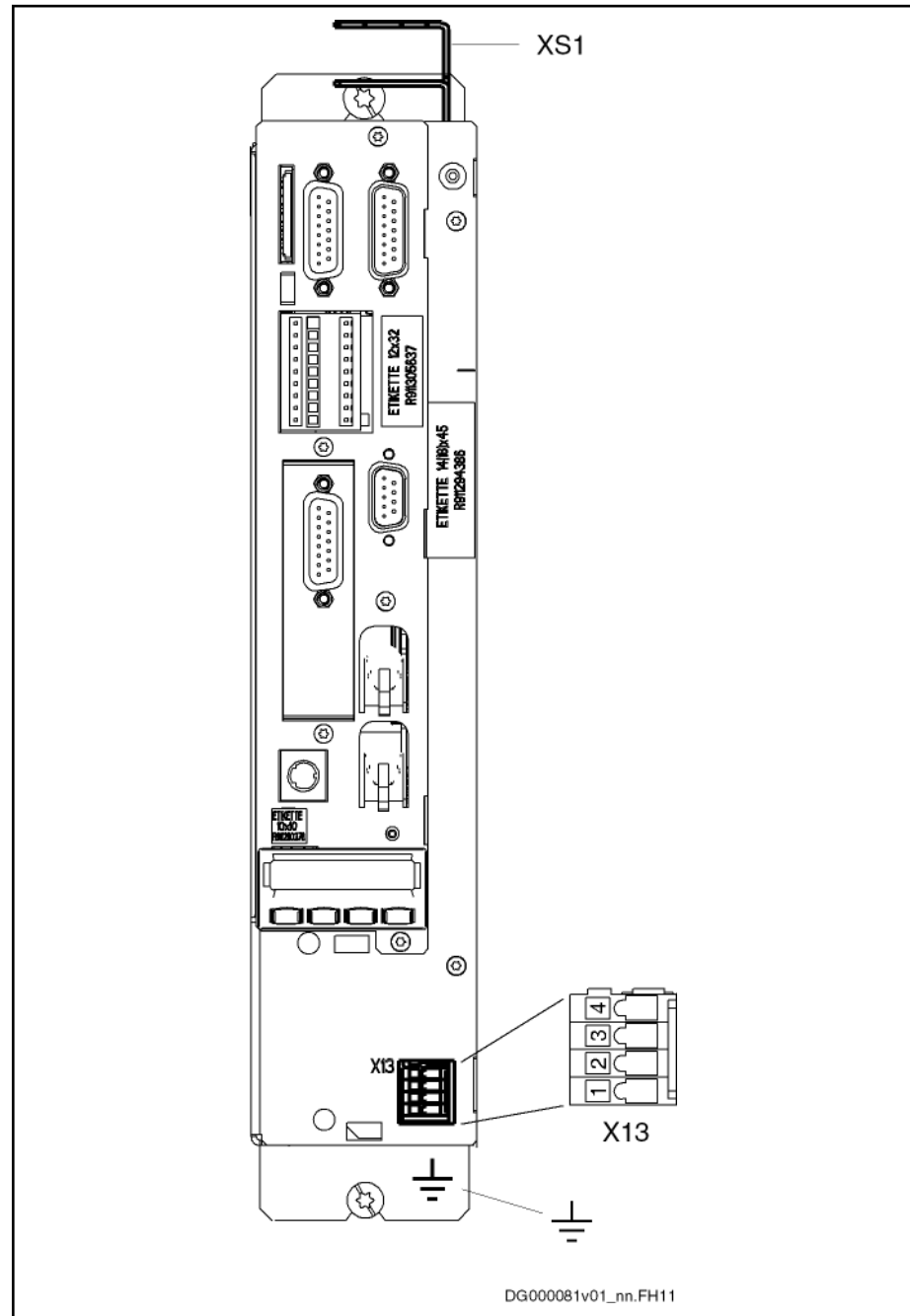
Fig. 5-17: Overall Connection Diagram



Apart from the indicated connections, it is necessary to wire the **Bb contact at the control section** for signaling the readiness for operation of the drive controller (see Project Planning Manual "Rexroth IndraDrive Drive Controllers Control Sections").

Arrangement of the connection points

Connection points power section HCS02.1E-W0012 (front)



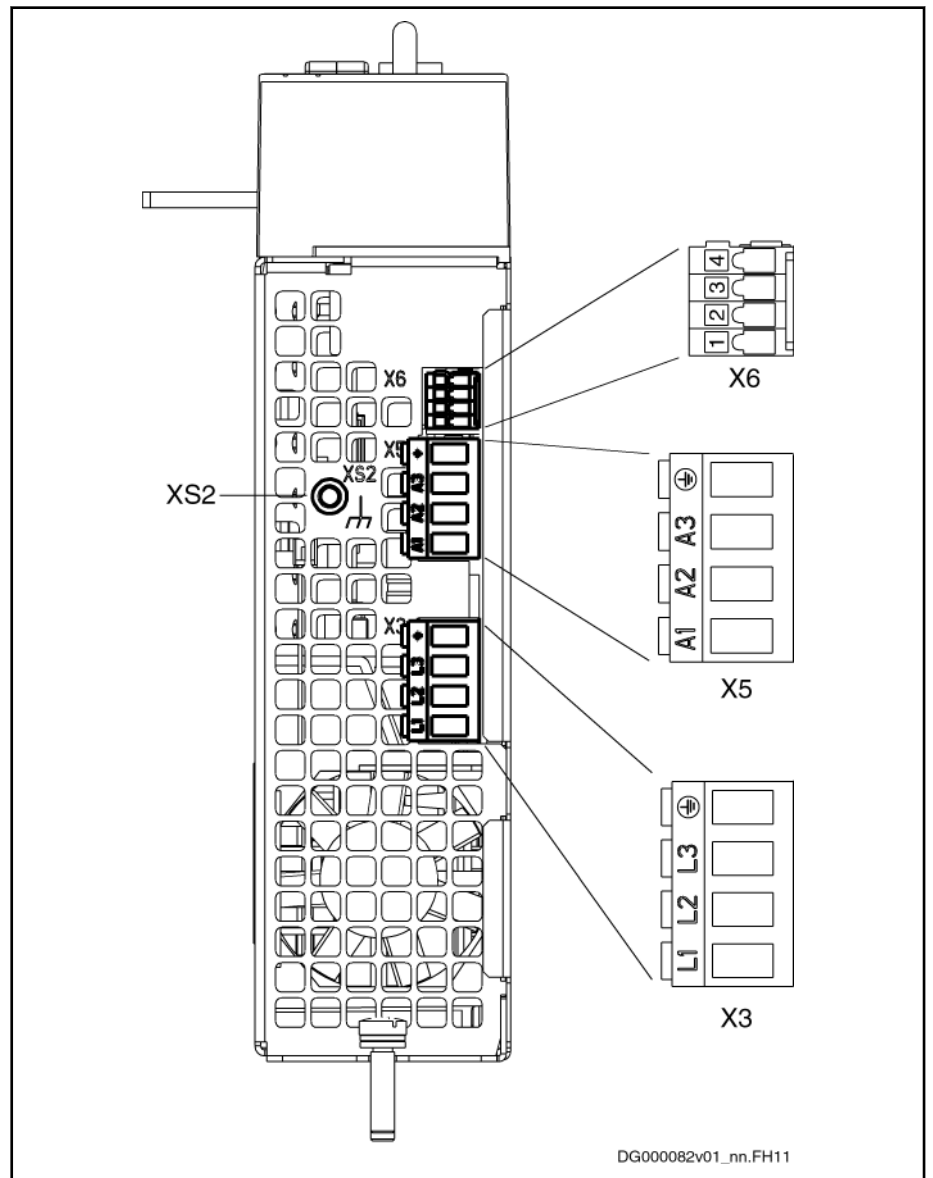
X13 Control voltage

XS1 Control line shield connection

Fig. 5-18: Connection points power section HCS02.1E-W0012 (front)

Power sections for converters - IndraDrive C

Connection points power section HCS02.1E-W0012 (bottom)

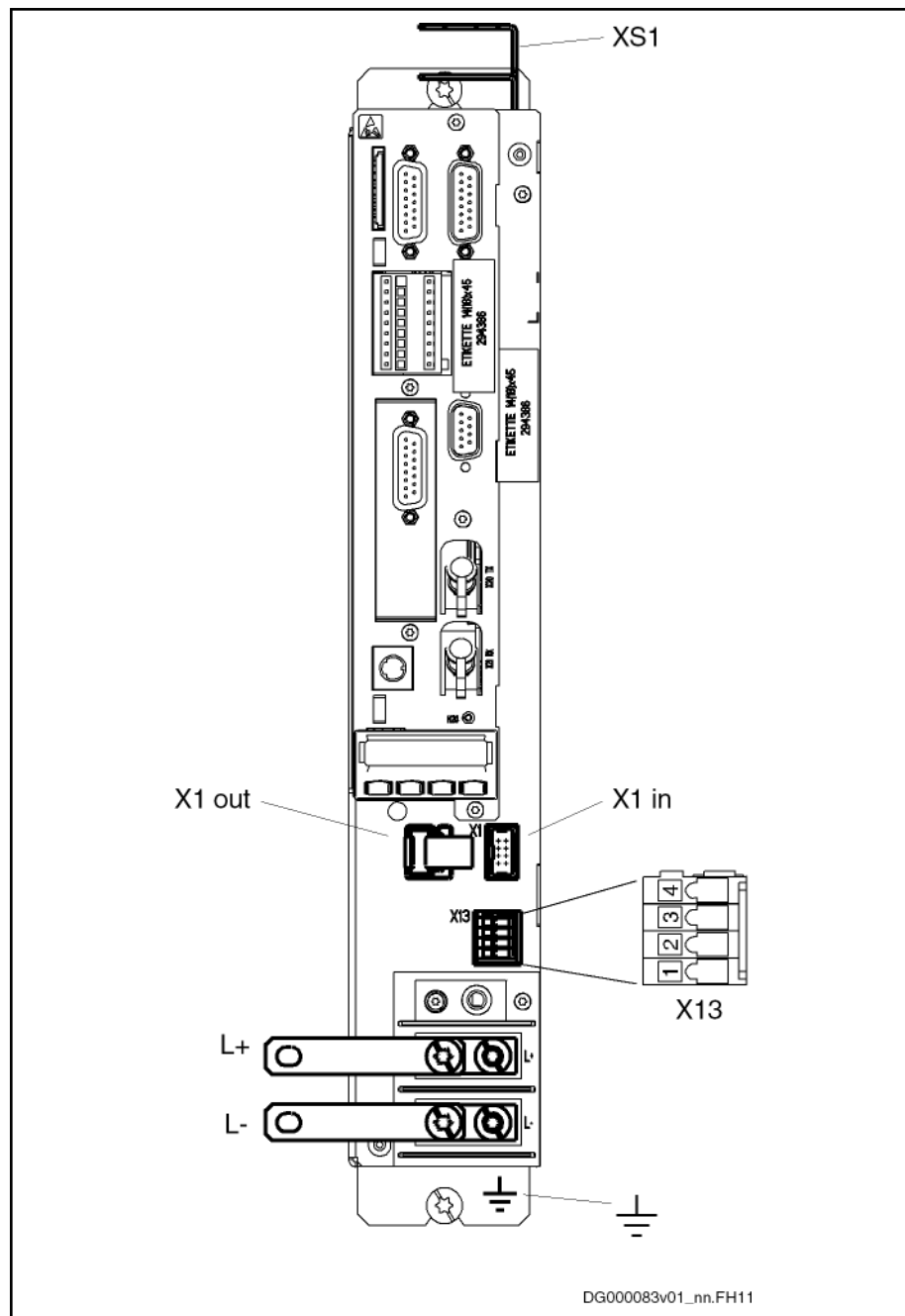


- X3** Mains connection
- X5** Motor connection
- X6** Motor temperature monitoring, motor holding brake
- XS2** Motor cable shield connection

Fig. 5-19: Connection points power section HCS02.1E-W0012 (bottom)

Power sections for converters - IndraDrive C

Connection points power sections HCS02.1E-W0028, -W0054, -W0070
(front)

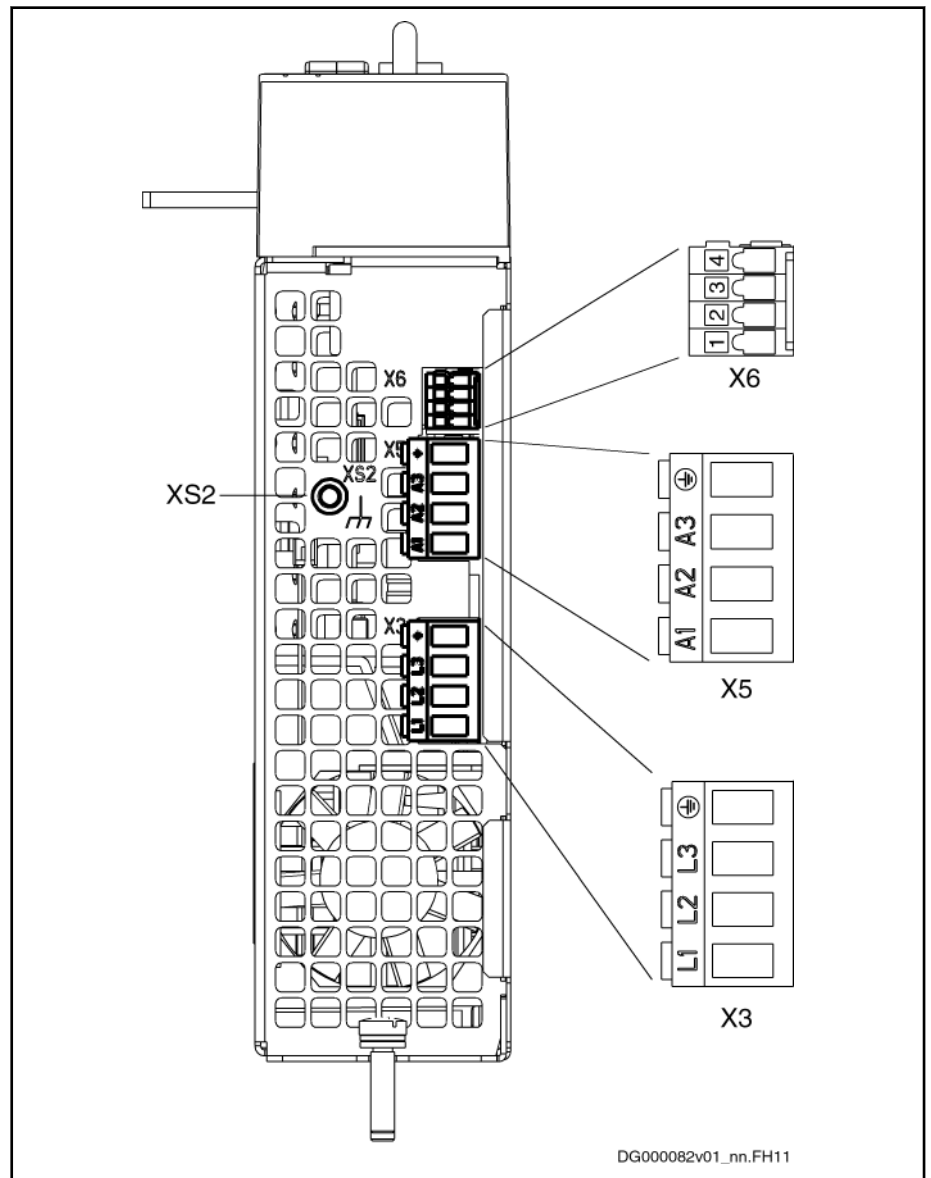


X1 Module bus
X13 Control voltage
XS1 Control line shield connection
L+, L- DC bus

Fig. 5-20: Connection points power sections HCS02.1E-W0028, -W0054, -W0070 (front)

Power sections for converters - IndraDrive C

Connection points power section HCS02.1E-W0028 (bottom)

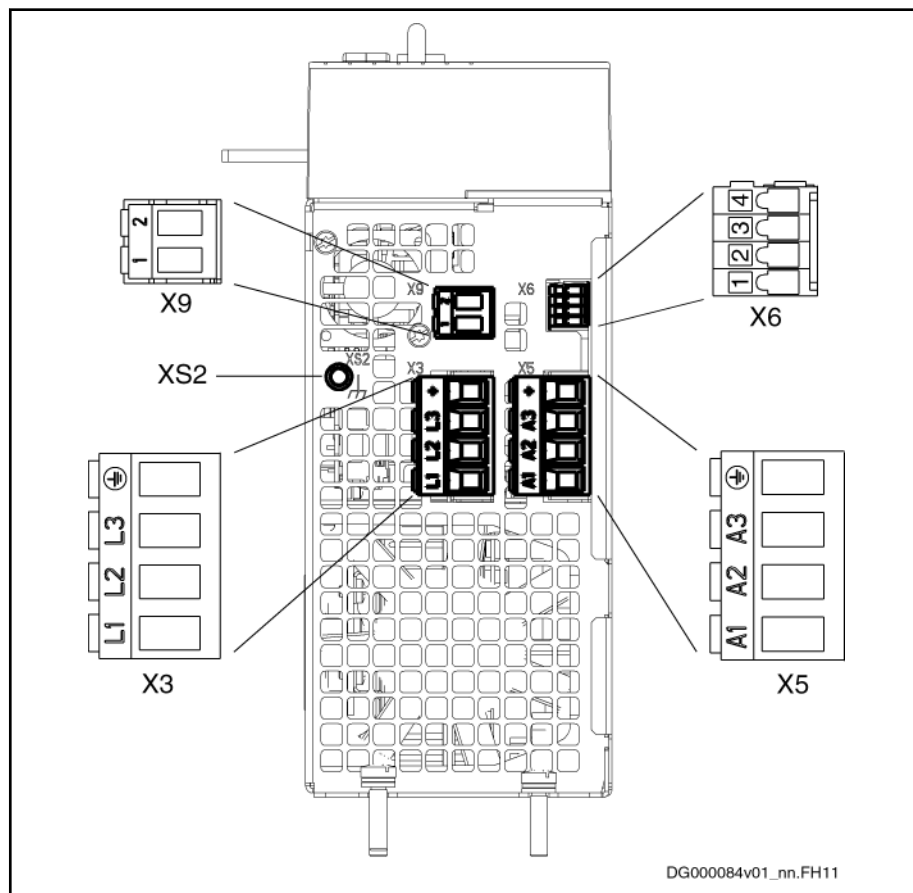


- X3** Mains connection
- X5** Motor connection
- X6** Motor temperature monitoring, motor holding brake
- XS2** Motor cable shield connection

Fig. 5-21: Connection points power section HCS02.1E-W0028 (bottom)

Power sections for converters - IndraDrive C

Connection points power sections HCS02.1E-W0054, -W0070 (bottom)



| | |
|------------|---|
| X3 | Mains connection |
| X5 | Motor connection |
| X6 | Motor temperature monitoring, motor holding brake |
| X9 | External braking resistor |
| XS2 | Motor cable shield connection |

Fig. 5-22: Connection points power sections HCS02.1E-W0054, -W0070 (bottom)

⚠ WARNING

Lethal electric shock from live parts with more than 50V!

Via the connection X3 (mains connection), connect the drive controller to the equipment grounding conductor system.

Description of the connection points

The connection points are described in detail in chapter 8 [Functions and connection points](#), page 271.

Touch guard The touch guard is described in detail in chapter 9 [Touch guard at devices](#), page 335.